

AUTOMOTIVE INDUSTRIES

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Contents

News of the Industry	679
Business in Brief	684
Tools of Tomorrow	688
Calendar of Coming Events	689
Fifty Pounds of Copper. By H. E. Blank, Jr.	690
Chilton Round Table	690
New Developments in Automotive Materials	695
Mawen Aircraft Engine Unique in Its Arrangement	700
Production Lines	701
Incandescent Electric Brazing	702
Just Among Ourselves	703
Radiator Design Considered as an Economic Problem. By Dr. Techn. M. F. Tréer	704
Advertisers' Index	46

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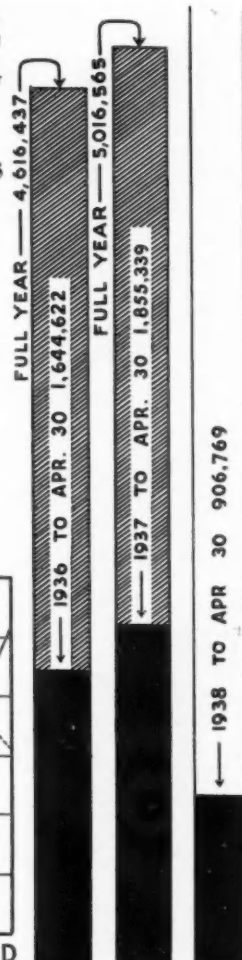
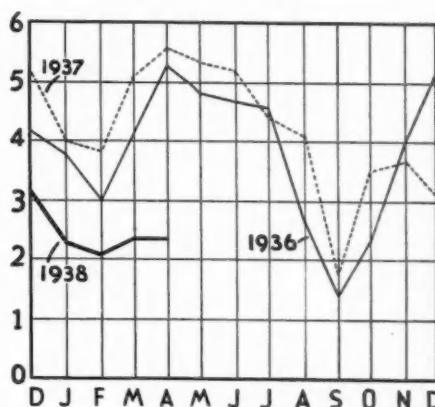
AUTOMOTIVE PRODUCTION*

Passenger Cars and Trucks
—U. S. and Canada

Bar charts at the right repre-
sent total production to April
30th of year indicated.

Numbers at left of monthly
graph below show production
in 100,000's.

*From Department of Commerce Report
and Automobile Manufacturers' Ass'n.



Ideas in Zinc

The Cadillac "60" Special is one of this year's out-
standing automobiles. The unique styling of this car
with its low roof line, absence of running boards,
extraordinarily wide seats and unusual visibility, sounds
a key-note for 1939 designs.

As would be expected, the Cadillac "60" embodies
some novel features that might pass unnoticed. One of
these is the three-section rear window frame fashioned
of a single ZINC Alloy Die Casting. With its gracefully
tapering end frame sections, this casting is 40 inches
in length and 12 inches in height.

Superseding the time-honored rolled molding which
has always been used for rear window frames, the die
casting offers many advantages both in eye appeal and
production economy. The generous opening, which
provides such unusual visibility, is given an exception-
ally strong frame and a more secure support is provided
for the large center section window. The one-piece
die casting permits an uninterrupted unified form and
its cross section can suggest any design that may be
desired. Neither of the latter two features is possible
in the conventional rolled frame—at least not within
the limits of production economy. Then, too, the
lustrous chromium finish is best expressed with the die
casting which is responsive to a quality electroplated
finish.

Here indeed is an excellent example of how advanced
design may follow new processes. The availability of
the research-tested ZAMAK Alloys, based on Horse
Head Special ZINC of 99.99+ per cent purity, has
assured the production of high strength, stable die
castings. The New Jersey Zinc Company, 160 Front
Street, New York, New York.

Idea No. 13

May 21, 1938

**NEVER HAVE TO
REPLACE THAT SEAL...
IT'S MADE OF
NEOPRENE**

*"Yeah...Notice
how many new cars
are coming through
with neoprene parts
in the tough spots."*

EVERY YEAR, neoprene is helping designers build longer life into more and more auto parts. For neoprene, Du Pont's remarkable chloroprene rubber, has all the best features of natural rubber . . . *plus* resistance to oils, gasoline, heat, sunlight, air and ozone.

You'll find neoprene used in water pump seals, oil pump gaskets, hand brake cable bellows, rocker arm grommets, radiator cap gaskets, gas tank filler hose, valve compart-

ment covers . . . in fact, you'll find neoprene used in more than *forty* tough spots in 1938 cars . . . where other materials have failed.

On 1939 cars, leading manufacturers are planning to use even more neoprene. For engineers have discovered that Du Pont neoprene makes better, longer lasting parts. And better parts make better cars. Doesn't this suggest that neoprene can help you win greater acceptance for your product too?



E. I. DU PONT DE NEMOURS & CO., INC., RUBBER CHEMICALS DIVISION, WILMINGTON, DELAWARE

May 21, 1938

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MADE BY DU PONT**

*Consult your
rubber supplier
or write us.*

AUTOMOTIVE INDUSTRIES

Production

April Probably Peak Month of Current Model Year

Production levels established during the second week in May were maintained during the week ending May 21, according to preliminary estimates based on a review of activity in car and truck plants.

Output during the current week should total approximately 49,800 units, which is roughly the same total achieved during the previous week. Pace during the past two weeks, however, has been below that of the first week in the month and below the weekly average maintained during April, which now seems likely to be uncontested as the peak production month of the current model year.

The seasonal decline now in effect apparently is being adjusted to production lines in easy stages rather than by any regular diminution of output. Although this week's figures will be approximately the same as those of the preceding week there are signs that production, like sales, is tapering off and output during the final week in the month probably will be lower than that of the past two weeks.

May output during the first three weeks will total approximately 157,000 cars and trucks, according to unofficial estimates, and with the lower schedules anticipated for the fourth and last week the total for the month should be fairly close to 200,000 units. This would represent a 16 per cent drop from April when 237,400 cars and trucks were produced, according to estimates released by the Automobile Manufacturers Association. Preliminary estimates have had a tendency to be slightly higher than official figures, making it appear likely that final figures for May will be on the underside of 200,000 rather than above it.

General Motors divisions, although still leading all other producers in total output, showed a drop from the previous week large-

ly because of shorter schedules in Chevrolet plants, with other divisions expecting to hold their own. The GM total should be about 17,800 units with Chevrolet accounting for 10,000; Pontiac, 1700; Olds, 1800; Buick, 3900; and Cadillac-LaSalle, 500.

Ford continued in second place



FLOYD F. KISHLINE

... who was recently named assistant chief engineer of Willys-Overland Motors, Inc. Mr. Kishline, formerly chief engineer for Graham-Paige Motor Corp., is chairman of the Detroit division of the Society of Automotive Engineers and has for many years been prominent in the motor car industry.

with a total of approximately 14,000, an increase over the previous week and giving Ford precedence over Chevrolet in the week's production totals. Chrysler divisions expected to equal their previous week's total, some 11,300 units.

Among the independents, Packard, Hudson, Nash and Studebaker also continued at their previous pace with Willys out of production for the week, as were Graham-Paige, Hupmobile, and Bantam.—J. A. L.

Labor

Umpire May Be Appointed In GM-UAW Agreement Dispute

Disagreement between the United Automobile Workers Union and General Motors over interpretation of a clause in their supplementary agreement permitting the corporation to maintain certain employees on a preferred list may result in the appointment of an umpire to arbitrate the dispute.

Submission of the dispute to an umpire was requested by Homer Martin, UAW president, after representatives of the union and the corporation had failed to reach a settlement with both sides sticking to their own interpretation of the preferred list paragraph. As this is being written, however, no decision to submit the argument to an umpire had been announced.

The disputed section in the agreement reads: "The management in each plant will prepare a separate list of employees who in the judgment of the management should be retained or recalled to work regardless of any other provisions in order to facilitate tooling or rearrangement of plant, the taking of inventory and the starting of production. In the selection of this list, length of service shall be secondary to other qualifications, but should be given reasonable consideration."

The UAW alleges that in several GM plants the list had been abused through the shifting of foremen, salaried and office workers, and guards to production lines replacing union members holding seniority rights. The corporation has contended that it has been within its rights under the agreement and a name-by-name check of the preferred list at the Chevrolet plant in Flint by UAW representatives has resulted in no change in the stand taken by either side.

Meanwhile factional differences within the UAW have been quieted down, for public consumption at least, through unanimous adoption

(Turn to page 687, please)

New Truck Registrations

Total new truck registrations* in March moved ahead of February 9322 units, an advance of approximately 34.5 per cent. Comparison with the total for March last year, however, shows a decrease of roughly 38.5 per cent. As recorded by the table below, the per cent change in the totals for the first three months of 1938 as compared with the similar period in 1937 amounted to minus 35.4 per cent.

	March	February	March	THREE MONTHS		Per Cent Change, 3 Months 1938 over 1937	Per Cent of Total Three Months	
	1938	1938	1937	1938	1937		1938	1937
Chevrolet	12,233	8,991	15,924	31,361	39,676	-19.0	33.15	26.40
Ford	9,899	7,687	20,386	26,699	52,716	-49.3	28.22	36.00
International	5,256	3,763	5,689	13,520	16,923	-20.0	14.30	11.56
Dodge	3,666	2,622	6,337	9,358	14,914	-37.2	9.90	10.19
G. M. C.	1,965	1,401	4,122	5,112	9,858	-48.1	5.40	6.73
Plymouth	769	562	1,104	1,999	2,004	-	2.11	1.37
Diamond T	390	338	815	1,053	2,223	-52.5	1.11	1.52
White	354	272	560	884	1,388	-35.3	.93	.95
Mack	352	217	476	823	1,221	-32.6	.87	.83
Reo	283	182	484	681	1,133	-39.8	.72	.77
Willys-Overland	174	138	76	488	258	+89.0	.52	.18
Studebaker	161	144	465	463	847	-45.3	.49	.58
Federal	136	109	236	383	640	-43.2	.38	.44
Autocar	110	95	179	334	421	-20.6	.35	.29
Hudson	77	81	539	257	1,172	-78.1	.27	.80
Brockway	86	57	140	207	357	-42.0	.22	.24
F. W. D.	17	27	24	110	90	+22.1	.12	.05
Divco	83	39	83	166	252	-34.0	.18	.17
Indiana	40	44	87	114	380	-70.9	.12	.26
Stewart	31	19	147	77	337	-77.2	.08	.23
Stutz Pak-Age Car	26	34	43	73	154	-52.6	.08	.11
Pontiac	21	16	23	55	70	-20.0	.06	.05
Sterling	17	9	23	42	70	-40.0	.04	.05
Miscellaneous	156	123	149	364	395	-7.8	.38	.27
Total	36,291	26,969	59,088	94,603	146,429	-35.4	100.00	100.00

* Does not include returns for Wisconsin. All data are comparable.

The Rise of the COE

Ford's Entry Into Cab-Over-Engine Truck Field Most Recent Development in Evolution Dating Back to 1908

With the accolade of Ford for the cab-over-engine truck as evidenced by the Ford Motor Co.'s announcement last week of its entry into the field, it seems appropriate to review in these columns the development of the COE from inception to the present day. In one respect the cab-over-engine truck is a comparatively recent development, because ten years ago practically every truck on the American market had the cab located back of the engine space and the engine covered by a removable hood. From another point of view, however, the type is quite old, its history extending back even to the time when trucks were not regularly equipped with driver's cabs, when the corresponding designation was "engine-under-seat" truck.

Probably the first vehicle of this type to be produced on a considerable scale was the Autocar delivery wagon with two-cylinder opposed horizontal engine under the driver's seat, which made its appearance in 1908. This was an outstanding success in the commercial-vehicle field at the time (though probably more for other reasons than the fact that

it had its engine under the seat), and it remained in production almost as long as the famous Model T. It is relatively easy to stow a horizontal engine under the seat, on account of its comparatively small height.

In 1911 there was something of a slump in the passenger-car market, and many automobile manufacturers then took up the commercial vehicle. A considerable proportion followed Autocar's example in lo-

cating the engine under the seat, and that year there were at least a dozen different makes of truck of the engine-under-seat type on the American market, many of them having four-cylinder vertical engines. Among the more familiar names other than Autocar connected with this practice at that time were Gramm, Mack, Sampson, and Hewitt. However, the various makes that were to achieve pre-eminence in the heavy-truck field during the teens—the Packard, Peerless, Pierce and Locomobile—all had the conventional layout of a four-cylinder engine under a hood in front, followed by the driver's compartment, and back of this the loading space. Although some protection against the inclemencies of the weather was afforded truck drivers during that period by a canopy, windshield and curtains, the closed cab with doors as we know it today became standard equipment of motor trucks only after 1920, after the adoption of pneumatic tires and the simultaneous large increase in truck speeds.

Most of the pioneer makes of truck which had the engine under the driver's seat disappeared from the market, and those that remained, including Autocar and Mack, changed to the conventional layout later, although Autocar has included one or more models of the engine-under-seat or cab-over-engine type almost continuously.

With growing use of trucks in inter-city haulage, following the adoption of pneumatic tires, there arose a demand for greater carrying capacity, and greater carrying capacity meant not only greater loading space but also increased engine power. All of the earlier large trucks had four-cylinder engines, but following the adoption

FORD'S new cab-over-engine truck offered in two models: a short-coupled 101-in. wheelbase completely new truck, and a 134-in. wheelbase model essentially the same as the standard 134-in. Ford truck. A complete description appeared in *AUTOMOTIVE INDUSTRIES*, May 14, page 653.



of pneumatic tires the six-cylinder engine became the standard type for heavy trucks. This, of course, called for additional space on the chassis, and providing this space and at the same time the additional loading space required, called for chassis of abnormal lengths of wheelbase. At the same time laws were passed limiting the over-all length of vehicles and the total load that could be carried on any one axle. With the conventional truck the pay-load at that time was very

(Turn to page 685, please)

Eastern Canada Registrations Off 22 Per Cent

A summary of new car registrations in eastern Canada covering leading models only, shows a decline for the first three months of about 22 per cent. The noticeable trend a year ago toward medium-priced models is not so evident this year.

New Passenger Car Registration (In Eastern Canada)

	Leading Models		Year to Date	
	March 1938	March 1937	1938	1937
Ford	1,416	1,751	4,056	4,435
Chevrolet	1,129	1,739	2,665	3,844
Dodge	850	1,459	2,110	3,239
Plymouth	753	1,196	2,016	2,683
Pontiac	387	505	951	1,221
McL.-Buick	285	303	785	784
Oldsmobile	225	437	588	1,144
Chrysler	206	355	621	861
Lafayette	171	160	426	354
Hudson	138	47	295	113
	5,560	7,952	14,513	18,678

P. E. I. not reported.

Provincial Summary

	March 1938	March 1937	Three Months 1938	Three Months 1937
Ontario	4,118	5,356	9,714	12,674
Quebec	879	1,781	3,634	4,526
New Brunswick	186	229	339	416
Nova Scotia	377	586	826	1,062
	5,560	7,952	14,513	18,678

Firestone URW Local Approves Contract Renewal

Renewal of the Firestone Tire & Rubber Co.'s Akron contract with the United Rubber Workers Union of America on substantially the same terms as were contained in the original contract which ended an eight week's Firestone strike a year ago, was overwhelmingly approved by members of the Firestone URW local at a special Akron mass meeting, May 15. Acceptance of the new agreement which takes the place of one which expired April 28, extends the only signed contract ever negotiated between a major rubber company and a CIO affiliate.

The contract continues the wage question on the same basis as last year, with an added provision that the agreement may be reopened by either party upon 10 days' written notice.

Goodrich-URW in Gordian Knot

*Akron Opinion Divided on Conclusions of Dr. A. F. Hinrichs
Presented in 31-Page Report on Labor Situation*

Although admitting the possibility that the B. F. Goodrich factories in Akron operate at a competitive disadvantage with modern plants of leading rubber companies in lower wage communities, Dr. A. F. Hinrichs, chief economist of the U. S. Department of Labor, avoids suggestion of any solution for the Goodrich management-union wage-hour controversy, in his 31-page report on the Goodrich labor situation, which was made at the request of the United Rubber Workers Union, a CIO affiliate. Copies of the Hinrichs' report have been filed with Dr. John R. Steelman, chief conciliator of the Department of Labor, and with Goodrich and URW officials in Akron. Analysis of Dr. Hinrichs' conclusions has resulted in divided opinion in Akron, with the result that the wage-hour controversy now appears to be tied in a tighter knot than ever before.

The URW petitioned for the wage-hour study when the Goodrich management last March announced that unless its 9300 Akron employees would submit to wage cuts averaging 12.3 per cent, it would be forced to transfer 5000 jobs out of Akron to lower-wage communities where it has subsidiaries. The Goodrich local of the URW rejected the wage cuts by a vote of 10 to 1.

While Dr. Hinrichs in one section of his report states: "Evidence in my possession indicates the possibility that the B. F. Goodrich plants in Akron operate at a competitive disadvantage with modern plants of the leading rubber companies in lower-wage communities," another section of his report contains the opinion that higher output per man-hour in Akron justifies a wage that is higher than in other parts of the country. He adds "Such evidence as the bureau of labor statistics now possesses indicates that there is no justification for a general wage decrease" with the added comment that "there is no reason to believe that a wage decrease by Goodrich in Akron will not be followed by wage decreases in other Akron tire and tube establishments."

Union leaders who have opposed the Goodrich wage-cut proposal have claimed that a Goodrich wage cut would be the signal for general wage cutting by all tire and tube companies both in Akron and in other

sections of the country. Akron's three major tire companies—Goodrich, Goodrich and Firestone cut salaries of all office workers 10 and 20 per cent April 1, the union charging that this action was the forerunner of wage cuts.

Comparing Goodrich operations with those of its competitors, Mr. Hinrichs said:

"Goodrich reports average hourly earnings in March, 1938, of \$1.046 for males and females for the entire Akron operations. At Miller, the average is 91.7 cents an hour.

"I estimate the average earnings in mechanicals, outside of Miller, to be \$1.01 and in tires to be about \$1.12. Goodrich wages in tires are probably quite similar to those of other Akron tire companies.

"The average hourly earnings for February, 1938, of tire and tube establishments reporting to the Bureau of Labor Statistics, including the mechanical departments of such establishments in some instances, were 84 cents outside of Akron.

"A number of individual establishments are averaging as low as 65 cents an hour.

"The comparison of Goodrich's mechanical operations with reports from establishments engaged in the production of rubber goods other than tires and tubes, and boots and shoes, is less valid than the comparison of tire and tube earnings. Goodrich manufactures many specialties.

"On the other hand, Goodrich does have a wide diversification of operations and it probably is significant that the average hourly earnings of February, 1938, of 150 establishments primarily manufacturing rubber goods other than tires and tubes, and boots and shoes was 59.7 cents."

Mr. Hinrichs pointed out the advantages of Akron as a rubber manufacturing center. He cited power costs, close proximity to the automobile center, presence of a large skilled labor force and existence of buildings and equipment.

He declared continuous replacement and improvement was needed over periods of time to prevent plants from becoming inefficient.

Discussing wage increases in the rubber industry he declared the URW "did not press for a general wage increase in Akron."

(Turn to page 689, please)



HAROLD E. YALE was recently elected president of the Pyro-Electro Instrument Co.

R. D. HILTY as new vice-president of the Mack-International Motor Truck Corp. will have charge of export sales and assist in establishing domestic dealer organizations.

B. H. JONES, CHARLES W. BAKER and **HAROLD W. LAGANKE** have been appointed assistant managers of sales for the National Screw & Mfg. Co.

ODBERT P. WILSON has been elected executive vice-president and treasurer of the Norma-Hoffmann Bearings Corp.

HAROLD H. SEAMAN and **IRVING SEAMAN** have severed their connection with the Seaman Body Corp., Nash-Kelvinator Corp. subsidiary, in order to devote their entire time to private affairs.

NELSON A. BEARDSLEY, general sales manager of Willys-Overland Motors, Inc., has resigned.

J. R. LAKE, F. T. LUTH and **J. L. HEATON** have been named general sales representatives for Willys-Overland Motors, Inc. Eight regional sales managers have also been appointed by Willys, including **R. E. Wedekind**, New York, northeastern area; **M. S. Suydam**, Baltimore, east central; **J. B. Dorris**, Atlanta, southeastern area; **F. M. Kinke**, Chicago, central; **H. B. Harper**, Denver, west central; **S. E. Brasseale**, Louisville, south central; **J. W. Stokes**, Toledo, north central; **G. Kavanaugh**, Oklahoma City, southwest area.

ROBERT F. BLACK, president of the White Motor Co., has been appointed chairman of the Motor Truck Committee of the Automobile Manufacturers Association. He succeeds **WILLIAM F. McAFEE**, manager of domestic sales of the International Harvester Co. Mr. McAfee will continue to represent his company on the Board of Directors of the Association, in which capacity he has served for several years. Announcement has also been made of the appointment of **R. W. RUDDON**, president of Federal Motor Truck Co., and **P. V. MOULDER**, manager of domestic truck sales of the International Harvester Co., to membership on the committee.

WILLIAM L. YULE, manager of the Buffalo plant of the Ford Motor Co., has been transferred to a similar post in Kansas City. **IRVING PIERCE**, assistant manager, will be in charge until a successor is appointed.

R. J. SCHULER, formerly general manager of sales of LaSalle Steel Co., Chicago, has joined the general sales organization of Republic Steel Corp. in the capacity of general sales representative of the Union Drawn Steel Division, Massillon. For the present Mr. Schuler will maintain his headquarters in the Detroit offices.

W. N. POTTER has been appointed vice-president and general sales manager of United Motors Service.

V. L. WANSELOW has been appointed to the western managership of the national accounts sales division of the B. F. Goodrich Co.

SPENCER T. HONIG is now Southern California distributor for Nash Motors division of Nash-Kelvinator Corp.

G. M. NAYLOR, manager of the crude rubber purchasing division of the B. F. Goodrich Co., left Akron May 16 for Singapore, Straits Settlement, British Malaya, where he will serve as managing director of the Goodrich Co. (SS) Ltd. Mr. Naylor succeeds **H. C. Bugbee**, who has been on duty in Singapore for Goodrich during the last three years and who will return to the Akron offices.

To Reopen Finance Company Case

Department of Justice Investigation of Finance Company Relations With Automobile Manufacturers Goes to South Bend, Ind.

The Department of Justice announced on Wednesday that it is presenting to a Federal grand jury in South Bend, Ind., on May 23, evidence of alleged violations of the antitrust laws by the Ford Motor Co., the Chrysler Corp., and General Motors Co. and their associated finance companies. The Department proposes to submit substantially the same evidence as that given to a grand jury in Milwaukee before Judge Ferdinand Geiger discharged the jury last December because of "impropriety" on the part of the Department in discussing a consent decree as an alternative to the jury's return of indictments.

Expressing the conviction that

its investigation has disclosed sufficient evidence of violations of the criminal provisions of the anti-trust law to warrant reopening the case, the Justice Department clarified its position with respect to civil and criminal procedures, crux of the difficulty in the Geiger dispute, and summarized its future policy as follows:

(1) A criminal case will not be compromised even though a defendant agrees to refrain from the alleged violations;

(2) Starting grand jury proceedings or a criminal prosecution does not waive the presumption of innocence but merely is indicative that the anti-trust division has evidence too important to ignore which must be referred to the courts for weighing; and

(3) In using civil and criminal proceedings concurrently, it is not the purpose to coerce or compel or threaten criminal prosecution in an attempt to effect a consent decree but to submit the evidence to an impartial tribunal.

The charge of coercion was a factor entering into Judge Geiger's complaint of "impropriety," but in announcing its policy on this point, the Department said that the doors will not be closed to businessmen who want to propose practical solutions at any stage of the proceedings. But it added that such solutions must be "voluntary."

"While we do not invite the submission of such proposals," the statement said, "it will be our policy in all cases to examine and consider any which may be made. They must offer in addition to a prohibition of the violations of the anti-trust laws with which the prospective defendants are charged, substantial public benefits connected with the policy of maintaining free competition in an orderly market which could not be obtained by the criminal prosecution."

Hereafter, under the Department's announced policy, any such proposals made while a case is pending will be presented to the court so that it may determine whether a nolle prosequere is justified in the public interest.

At the same time, Attorney General Cummings announced a new policy of making public on "an experimental basis" actions to be brought under the anti-trust statutes as a guide to business and industry covering the Department's prosecution policy. The automobile finance case was the first to be announced under the new procedure and was the first to be instituted by the new Assistant Attorney General, in charge of the anti-trust division, Thurman Arnold, former Yale law professor and author of "Folklore of Capitalism."



International News Photo

FREDERICK H. WOOD

... chief counsel in New York of Ford Motor Co. pictured at hearing held May 10 in Sixth Circuit Court of Appeals at Covington, Ky., where the National Labor Relations Board's efforts to withdraw the record of the Ford Motor Co. case were blocked by the court. Mr. Wood described the ruling as a "victory for Ford" and said that its effect would be to prevent the NLRB from vacating its order of last December which directed reinstatement in Michigan plants of 29 workers who the board claimed were discharged for union activity.

New Passenger Car Registrations

A 48.5 per cent increase lifted the March new passenger car registrations* 57,188 units above the total for the preceding month. However, the March, 1938, total of 174,918 fell below March, 1937, by slightly more than 50 per cent.

As indicated by the appended data, the per

cent change in new registrations for the first three months of 1938 as compared with the similar period last year is expressed by a minus 48.1. Comparison of the five months of the model years 1938 and 1937 shows the 1938 totals lagging by 41.8 per cent.

	MARCH	FEBRUARY	MARCH	THREE MONTHS		Per Cent Change, 3 Months, 1938 over 1937	Per Cent of Total Three Months		FIVE MONTHS MODEL YEAR		Per Cent Change
	1938	1938	1937	1938	1937		1938	1937	1938	1937	
Chevrolet	44,660	29,003	75,724	107,281	158,488	- 32.6	24.66	19.04	209,556	299,834	- 30.0
Ford	34,941	27,118	83,458	97,354	208,176	- 53.5	22.38	24.97	143,146	297,907	- 51.9
Plymouth	22,983	14,196	49,382	54,358	130,512	- 58.4	12.50	15.58	102,711	217,805	- 52.7
Buick	14,846	9,085	16,445	34,990	37,379	- 6.4	8.04	4.46	67,899	74,294	- 8.5
Dodge	10,223	6,530	27,747	24,425	69,539	- 64.9	5.62	6.30	49,337	110,610	- 55.5
Pontiac	9,492	6,043	19,312	22,625	43,726	- 48.3	5.20	5.22	44,896	75,082	- 40.2
Oldsmobile	8,865	5,723	18,061	21,210	39,503	- 46.4	4.88	4.72	40,759	63,143	- 35.5
Chrysler	4,560	3,099	9,039	11,486	21,248	- 46.0	2.64	2.54	23,561	33,332	- 29.5
Packard	4,693	3,212	10,140	11,313	23,051	- 50.8	2.60	2.75	21,877	37,218	- 41.1
Hudson	4,077	2,835	9,891	9,757	25,461	- 61.7	2.24	3.04	16,787	42,000	- 55.3
De Soto	3,750	2,201	7,863	8,747	17,667	- 50.5	2.01	2.11	17,713	26,621	- 33.5
Studebaker	3,155	2,328	7,399	8,132	16,824	- 51.6	1.87	2.01	15,591	28,760	- 45.8
Nash	2,862	1,945	6,431	7,431	14,437	- 48.5	1.72	1.72	14,040	22,089	- 36.5
Lincoln	1,603	1,250	2,456	4,565	5,868	- 22.1	1.05	.70	7,957	9,551	- 16.7
Willis	1,218	1,037	5,284	3,606	11,096	- 67.5	.83	1.32	7,970	12,772	- 37.5
La Salle	1,199	799	2,897	3,060	5,967	- 48.7	.70	.71	6,429	10,373	- 38.0
Cadillac	1,039	795	1,001	2,626	2,698	- 2.9	.60	.32	3,865	5,011	- 23.0
Graham	472	357	1,284	1,361	3,108	- 56.2	.31	.37	2,694	5,585	- 51.7
Hupmobile	93	71	245	245			.06		470	22	
Pierce-Arrow		2	28	7	96	- 92.6		.01	21	196	- 89.3
Miscellaneous	187	101	246	393	914	- 57.0	.09	.11	698	2,765	- 74.6
Total	174,918	117,730	354,048	434,972	837,758	- 48.1	100.00	100.00	799,977	1,374,970	- 41.8
Chrysler Corp.	41,516	26,026	94,011	99,016	238,966	- 58.6	22.80	28.52	193,322	388,358	- 50.1
Ford and Lincoln	36,544	28,368	85,914	101,919	215,044	- 52.6	23.43	25.68	151,103	307,458	- 50.9
General Motors	80,101	51,448	133,440	191,792	288,761	- 33.5	44.05	34.47	373,404	527,737	- 29.3
All Others	16,757	11,888	40,683	42,245	94,987	- 55.5	9.72	11.33	82,148	151,407	- 45.8

* Does not include returns for Wisconsin. All data are comparable.

... slants

SUPERANNUATED—One in every six farm cars is 10 years old or over, according to a survey just made by the Federal Census in cooperation with the United States Department of Agriculture. The survey covered about 3000 farms in selected counties of 40 States. More than half of the farm automobiles are reported to be models of more ancient manufacture than 1933. Likewise, farm figures for trucks and tractors convey an even more striking picture of obsolescence, with one-fourth 10 years old or over and relatively small percentages of models 1932, 1933, and 1934.

TRACTOR DATA—The value of tractors produced during 1937, according to the Bureau of the Census, Department of Commerce, totaled \$268,394,076. Compared with \$214,853,968 in 1936 and \$147,825,552 in 1935, the figure for 1937 represents an increase of approximately 25 and 81 per cent, respectively.

An estimate of tractors on farms in the United States as of March 1, 1938, reprinted from *Implement & Tractor* in Bulletin No. 530 of the Motor and Equipment Manufacturers

Association, amounts to 1,487,331. The four leading States are listed as follows: Illinois, first with 129,744 tractors; Iowa, 121,310; Texas, 99,490, and Kansas, 93,975. In England, approximately 60,000 tractors are in use.

Yellow Truck & Coach Declares Dividend

The Yellow Truck & Coach Mfg. Co. has declared a quarterly dividend of \$1.75 per share on the 7 per cent cumulative preferred stock, payable July 1 to stockholders of record June 15.

Firm Formed for Pierce-Arrow Maintenance and Service Parts

A new firm called the 1685 Elmwood Ave. Corp. (location of the Pierce-Arrow plant in Buffalo) has been formed to take over the assets of the Pierce-Arrow Corp. and will continue maintenance and service parts operations. It is understood that a 10-day option has been granted to Walter E. Schott of Cincinnati, to purchase this part of the business.

The new corporation filed the necessary papers, registered the firm's name in the county clerk's office in Buffalo, paid the \$40,000 asked price

and promptly took over the business.

The \$40,000 represented the highest bid offered at the auction of the defunct motor car company. It was posted by William M. Emblidge, attorney for the Marine Trust Co. and the Federal Reserve Bank of New York, holders of liens totaling over \$1,300,000. Liens totaling \$78,200 are held by Mr. Schott against parts and inventories while city and county hold tax liens of \$140,000.

Correction

The financial statement of the Motor Wheel Corp. for three months' operations ended March 31, 1938, was incorrectly reported in the May 14 issue of *AUTOMOTIVE INDUSTRIES*. Instead of a profit for this period the corporation balance sheet shows a net loss of \$69,415.79.

Railway Requests Bus Order

The Sante Fe Trail Transportation Co., Wichita, Kan., subsidiary of the Atchison, Topeka & Santa Fe Railway Co., has applied to the Interstate Commerce Commission for authority to issue \$740,812.50 in securities for the purchase of 45 de luxe, air-conditioned passenger buses from the A.C.F. Motor Co.

Business in Brief

Written by the Guaranty Trust Co., New York

Most lines of business activity continued downward last week, and the recession was particularly noticeable in railway traffic. The index compiled by the *Journal of Commerce* stood at 69.1, as compared with 69.7 the week before and 103.0 a year ago. Unfavorable weather last week retarded the sales of wearing apparel, and retail sales as a whole were about 3 per cent below those in the preceding week and from 5 to 12 per cent below those a year ago.

Railway freight loadings during the week ended May 7 amounted to 536,140 cars, which marks a decline of 6935 cars below those in the preceding week, a decrease of 227,335 cars below those a year ago and a fall of 132,726 cars below those two years ago.

According to the Department of Labor, retail food costs rose 1.1 per cent during the 30 days ended April 12. Prices were lower for 50 of the 84 items included in the index, but these reductions were more than offset by a sharp rise in the cost of fruits, vegetables, and meats.

According to the Board of Governors of the Federal Reserve System, department store sales during

April rose by less than the usual seasonal amount. The board's adjusted index stood at 83, as compared with 85 in March and 93 for the corresponding month last year.

A moderate expansion occurred in store chain sales in April, and the volume reached the highest level of this year. The index compiled by the *Chain Store Age* stood at 105.2, as compared with 103.3 for the month of March.

Lumber production during the week ended April 30 stood at 49 per cent of the 1929 weekly average. Shipments and new orders were larger than those in the preceding week, but production was smaller.

Professor Fisher's index of wholesale commodity prices for the week ended May 14 stood at 80.8, as compared with 80.5 the week before and 80.6 two weeks before.

The consolidated statement of the Federal Reserve banks for the week ended May 11 showed no changes in holdings of discounted bills, bills bought in the open market, and Government securities. Money in circulation declined \$11,000,000, and the monetary gold stock increased \$10,000,000.

the removal of the Toyota plant at Koromo, manufacture of the new model will start in earnest. New models are scheduled to appear this fall.

Contrary to the recent prospect of a long delay, the Toyota concern has obtained the Finance Ministry's understanding in regard to the financing of the projected assembly plant in Tientsin, North China. Toyota is rushing preparations to start automobile assembly work there as early as June.

"Rokko" Passenger Car

At the site of its former aircraft factory, which is being removed, the Kawasaki Sharyo Kaisha will build a new plant for production of "Rokko" cars at the rate of 3000 a month. An amount of 5,000,000 yen has been earmarked for tool purchases from the United States. The firm's line includes a four-cylinder Diesel chassis for bus and truck as well as a new car model and gasoline-engined trucks.

The new "Rokko" passenger-car model has a wheelbase of 128 in. and is rated at 90 hp. It sells at 12,000 yen (about \$3,500).

Tokyo Gear Works Organizing

The Fund Adjustment Commission has granted a permit for the organization of the Tokyo Gear Works with a capital of 3,000,000 yen. The firm is a joint enterprise of the Ishii Iron Works, Daido Electro-Steel Works, Tokyo Wheel Works and Anzen Automobile Co., the "Dodge" representative in Japan. Machinery purchases from the United States will amount to 700,000 yen. Differentials and transmission gears will be the principal lines of the firm. Out of a demand exceeding 20,000,000 yen annually, only 500,000 yen worth of gear products for automotive purposes are at present supplied by Japanese makers.

Diversified Technical Program For ASTM Annual

At the annual meeting of the American Society for Testing Materials, which will be held at Chalfonte-Haddon Hall, Atlantic City, N. J., June 27-July 1, there will be a symposium on impact testing extending over two sessions, to be held on the afternoon and evening of June 28. On June 29 one of the morning sessions will be devoted to radiography.

On the afternoon of the same day Dr. Albert Sauveur will present the Edgar Marburg lecture, the subject being "The Torsion Test." On the evening of June 29 there will be a

Japan May Cut GM and Ford Output

Fifty Per Cent Slash Anticipated for Present Rates Of 9470 and 12,360 Units Annually

Production quotas of GM and Ford plants in Japan, now established under Japan's Automobile Industry Law at 9470 and 12,360 units annually, may be subjected to a slash amounting to 50 per cent, according to the *Nippon Kogyo Shimbun*.

Moreover, the paper credits government authorities with the intention to force the firms to produce seven trucks against each three passenger cars to remove friction with Japanese manufacturers who have been particularly active in the car field of late. The new ratio is about the reverse of the output plan which the firms have followed in recent years in accordance with actual market conditions.

The Tokyo Automobile Industry Co. is scheduled to produce at the rate of 30,000 units a year, Toyota about half this much, and Nissan

about 12,000 cars. Compared with last year's output, this would involve an additional combined productive capacity for 15,000 cars.

The authorities hold, the paper concludes, that the market will be over-supplied even if the foreign firms operate at one-half their present capacities. From now on the pressure on car imports will become stricter, in contrast to the temporary alleviation of import restrictions which had been necessitated by the dislocated market situation at the end of last year and early this year.

Toyota Has New Model

Very much resembling the latest "Opel," product of GM's German subsidiary, the new model recently shown by the Toyota Automobile Co., Nagoya, has a piston displacement of 2400 cu. cm. After completion of

session dealing with temperature effects and fatigue of metals. Reports of various committees on steel and ferrous alloys will be received at a morning session on June 30. On the evening of June 30 there will be sessions devoted to cast iron and petroleum products.

Non-ferrous metals will be dealt with at a morning session on July 1. and at the same time there will be a session at which papers and reports will be presented on textiles, paint, and plastics, including rubber.

April Crude Rubber Consumption Off 8.2% From March

Consumption of crude rubber by manufacturers in the United States during April, 1938, is estimated at 27,984 long tons, a decrease of 8.2 per cent under March. According to statistics released by the Rubber Manufacturers Association, April consumption was 46 per cent under April a year ago.

Gross imports of crude rubber reported for April amounted to 30,807 long tons, a decrease of 14.3 per cent under the March figure of 35,967 long tons and 14.1 per cent under the 35,850 long tons reported in April, 1937.

Total domestic stocks of crude rubber on hand April 30 amounted to 301,436, which compares with March 31 stocks of 299,172 (revised) long tons and 176,289 (revised) long tons on hand April 30, 1937.

Another Super-Highway Plan

Along with the dozen or more super-highway proposals pending in Congress, Representative Drew, Democrat, of Pennsylvania, dropped into the Congressional hopper last week a resolution designating a Congressional committee to prepare plans for building a national highway from Jersey City, N. J., to Washington.

The committee, which would have power of subpoena, would report back to Congress in January with specific recommendations. No amount was fixed for the cost of the inquiry.

Sponsors of the move were represented as being interested in the construction of such a highway more from the standpoint of national defense and military use rather than for pleasure utilization. Some reports had it that they had in mind a heavy-duty road connecting munition and manufacturing centers along the right-of-way, without running directly through key cities and without absorbing portions of existing roads.

The Rise of the COE

(Continued from page 681)

nearly centered over the rear axle, with the result that with the truck fully loaded there was barely enough load on the front axle to insure reliable steering. Thus the legal carrying capacity of the truck was usually limited by the load on its rear axle, and by placing a greater proportion of the load on the front axle the pay-load capacity could be increased.

It was this condition of affairs which was chiefly responsible for the reintroduction of the cab-over-engine design during the early thirties. A somewhat similar movement in the motor bus field had preceded it, and probably had its influence on motor truck manufacturers in inducing them to make the change. With a view to making all of the floor space of the bus available for passengers, Frank Fageol had introduced the so-called Twin Coach, in which there were two separate powerplants, one under each longitudinal row of seats, which were accessible from the outside of the bus. Following this, the White Company in 1932 developed a twelve-cylinder horizontal opposed engine for under-floor mounting, also for use in buses. Of course, neither of these powerplants seemed well adapted for use on trucks, because of the relatively high first cost. Fageol, however, in 1932 built a refuse truck which had its engine mounted centrally in front and the cab "built around the engine," as contemporary technical descriptions phrased it. In 1932 Autocar came out with a new cab-over-engine model, and since that time almost every truck manufacturer has produced models of this type.

The advantages of the cab-over-engine construction are obvious. There are, however, some difficult problems involved in the design of such a truck, one of them being that of providing easy accessibility of the various engine parts and accessories that require attention occasionally. The engine can hardly be made as accessible under the floor of the cab than when it is located out in front under a hood, and one possible explanation of the long delay in the adoption of this arrangement by the truck industry generally, in spite of its obvious advantages, is that as long as truck engines required frequent atten-

tion on the road, location of the powerplant in a more or less inaccessible position did not appeal to operators.

National Training School For Ethyl Motor Clinic Managers

A national training school for its Motor Clinic managers was opened at Baltimore on May 16 by the Ethyl Gasoline Corp. Representatives of the corporation from the principal industrial centers are taking part in a course of instruction involving the problems of a nationwide clinic program recently inaugurated to develop "closer working relationships between the oil and automotive industries."

A chief objective of the school will be standardization of clinic procedures and the experience of the past several months of clinic operation in various regions of the country will be analyzed and the general clinic program reshaped.

40 Years Ago

with the ancestors of
AUTOMOTIVE INDUSTRIES

Electric Vehicle Company

On June 3 the General Electric Automobile Company was organized in Philadelphia under the laws of West Virginia, with an authorized capital stock of \$2,500,000, consisting of 50,000 shares of a par value of \$50. There is no preferred stock and no bonds.

The organizers are John A. Brill, of the J. G. Brill Co., car builders; Prof. W. D. Marks, Rudolph M. Hunter and John H. Noblit.

The company has secured control of a series of patents granted to Rudolph M. Hunter, the well-known patent attorney of Philadelphia, covering the application of storage batteries to vehicles, and claimed to be fundamental and dominating in their character. The policy will be to license companies in the various cities of the country to use this system for public conveyances, and also to manufacture carriages for private sale.

From *The Horseless Age*, June, 1898.

Automotive Metal Markets

Leading Steel Producers Continue to Push Research Despite Economies Enforced by Adverse Market

Leading steel producers are giving the most practical demonstration of their faith in the early return of normal demand for their products by not allowing the work of their research laboratories to be unduly impaired by the general economy programs that adverse market conditions have forced upon them. News of metallurgical progress in one form or another continues to trickle through, although it is sensed that not a few important developments are being kept under cover pending a more opportune time for their exploitation. Announcement has just been made of the perfecting of an open-hearth steel possessing, in addition to the ordinary physical properties of that class of steels, the machining qualities of Bessemer screw stock.

More and more, the steel industry comes to depend for prosperity not so much on bowling over past tonnage records as on improving the quality of steels, so that their higher efficiency will justify a premium over the base prices of run-of-the-mill steels. A good deal of the steel market's unfaltering optimism, when it comes to the long-range outlook, is based on this slant and serves as a moral prop while the market's immediate picture offers but little cheer. There has been a little buying of flat steel to provide for what there remains of current model production. Current rate of operations in primary as well as finishing mills remains virtually unchanged, the American Iron and Steel Institute reporting a microscopic improvement in employed ingot capacity this week, 30.7 per cent being in operation as against 30.4 per cent last week.

Impendency of an announcement regarding third-quarter steel prices furnished the steel market with a topic of conversation, but had no influence on buying. What continues to keep buyers on the side lines is not price, but lack of demand for their own products.

In the tin market it is recognized that the immediate outlook for better demand from automotive consumers is rather disappointing, and in fact this had much to do with the primary markets staging a retreat from the higher ground, which had been attained following the sharp dips of a few weeks ago. Some of the tin interests found

considerable comfort in the bill introduced by Senator Thomas, which provides for an expenditure of \$100,000,000 over four years for the purchase of strategic metals, in which tin is included. The International Tin Research and Development Council, The Hague, Holland, is carrying on vigorous propaganda in support of the buffer pool plan, but whether so artificial a market set-up will prove practical remains to be seen. Spot Straits opened the week at 37.10 cents and on Tuesday eased off further, closing rather weak at 36.35 cents.

Although stocks of refined copper continue to mount, the latest report of Copper Institute, Inc., showing an increase by 12,900 tons to 355,660 tons, the market remains steady at 10 cents for electrolytic. April was the twelfth consecutive month in which there were additions to the surplus. London is no longer quite so bullish on the copper situation, the export price on Tuesday being quoted at 9.54 cents. In the outside market here producers' prices might be shaded $\frac{1}{8}$ of a cent.

Low prices have caused both miners and smelters to be rather offish. A small amount of routine business is being done, of course, but on the whole there is a disposition to wait for a turn for the better and meanwhile sit tight. Dealings in the lead market are confined to requirements for nearby weeks.—W. C. H.

Engine Rebuilders Association Plans Four-Day Session

Arrangements are rapidly being completed for the sixteenth annual convention of the Automotive Engine Rebuilders Association which will be held in the Book-Cadillac Hotel, Detroit, June 20, 21, 22, and 23.

Such subjects as Merchandising of Shop Service, Safety and Resulting Business, Cylinder Finishing by the Use of Various Types of Tools and Equipment, Flat-Rate Shop Operations, Branch Operation, How to Teach Customers Ways and Means to Secure Additional Business, and Modernized Selling and Cost Comparisons are a few of the many topics to be discussed at the technical sessions.

The Federal-Mogul Corp. will be host Tuesday evening to all registered engine rebuilders on a cruise up the Detroit River. Inspection trips through the Ford and Chrysler automobile manufacturing plants have been arranged by the Detroit committee with Walter Kleinschmidt, the Automobile Equipment Co., as chairman.

Goodyear-Sears

Tire Price Discrimination Case Remanded to Lower Court

Reversing the decision of the Circuit Court of Appeals in the Goodyear Tire & Rubber Co. case, the Supreme Court on Monday held that the case did not become moot because the company upon passage of the Robinson-Patman Act discontinued a practice which the Federal Trade Commission held violated the original Clayton Act. The Robinson-Patman Act is an amendment to the Clayton law. The Supreme Court by this decision held that the lower court was not warranted in setting aside the FTC order and remanding the case to the commission without prejudice to the filing of a supplemental complaint under the Robinson-Patman Act. The Goodyear company had been ordered by the FTC to cease and desist selling tires and tubes to Sears, Roebuck & Co., at allegedly discriminatory prices. As a result of the Supreme Court decision the orders of the FTC entered before passage of the Robinson-Patman Act are to remain in force, and the decree was remanded to the lower court for a determination of its merits.

The Goodyear company appealed from the FTC orders of March, 1936, asking the Circuit Court of Appeals for a review of the case. While the petition was before the lower court the Robinson-Patman law was enacted. Because of the later law, the Goodyear company surrendered its original Sears, Roebuck contract and made a new price arrangement designed to conform to the Robinson-Patman law. Within a year all transaction between Goodyear and Sears, Roebuck had ceased.

The lower court concluded that the case had become moot, set aside the FTC order, and remanded the case. It did so without direction to the commission to dismiss the complaint and without prejudice to its filing of a supplemental complaint in the original proceeding if this could be done under the amended act, to which the court expressed no opinion.

Both the FTC and Goodyear main-

tained that the case had not become moot.

"While they disagree in their reasoning, they come to the same conclusion upon this point," said the Supreme Court, "and both ask that the case be remanded to the Circuit Court of Appeals with directions to determine it upon its merits. We think that their conclusion is correct and that the remand should be made."

The Supreme Court declared that discontinuance of the practice which the commission found to constitute a violation of the act did not render the controversy moot. It said the FTC order is a continuing order and that its efficacy, if valid, was not affected by the subsequent passage or the provisions of the amendatory act. As a continuing order, the Supreme Court said, the commission may take proceedings for its enforcement if it is disobeyed. But under the statute, it was pointed out, the respondent was entitled to seek review of the order and have it set aside if found to be invalid.

"The question which both parties sought to have the Circuit Court of Appeals decide was whether respondent's conduct was a violation of the original statute," the decision said. "Neither the transactions subsequent to that order nor the passage of the amendatory act deprived the respondent of its right to challenge the order and to have its validity determined or the commission of its right to have its order maintained if validly made."

GM Physicians Hold Annual Conference

More than 60 General Motors physicians from all sections of the United States and from Canada, attended the annual General Motors Medical Conference held in Flint, May 19-20.

The GM physicians discussed development in health maintenance work in the plants during the past year, and shared the results of their research on various medical problems. A similar conference was held in Indiana last year.

The first day's meetings was held in the Buick Motor Division Personnel Building and the second day's meetings in the AC Spark Plug Division Personnel Building. As part of the conference program, trips were made through the General Motors plants in Flint.

Dr. R. R. Sayers, Senior Surgeon of the United States Public Health Service, was one of the principal

speakers at the annual banquet held on May 19, with his subject "The Present Status of Disease in Industry."

LABOR

(Continued from page 679)

by the international executive board of a resolution giving Homer Martin a vote of confidence and supporting a harmony program he submitted. Martin's program calls for support of a drive to organize non-union shops in other cities competing with union shops in the Detroit area; support of the CIO in a campaign to organize Ford employees; strict observance of all contracts; recognition by all members of the authority and responsibility of the international executive board; cooperation of all members and officers in the prevention of wildcat stoppages and strikes; resistance against wage reductions and support of authorized strikes; building of strong local and international treasuries for the preservation of union strength; and continued whole-hearted support of policies and principles of the CIO. The board also adopted a resolution commending all of the UAW officers, including Richard T. Frankenstein, recently demoted by President Martin from assistant president to vice-president.

Reuben Peters, leader of the recent sitdown strike in the Chevrolet plant in Bay City and president of the UAW local there, has been discharged. No comment on his dismissal has been made by Martin other than that the union was investigating. This particular strike was one of three recently condemned by Martin with the threat of disciplinary action against those responsible if an investigation warranted such a step.

Threats of a strike in tool and die plants have subsided with acceptance by the union of a new agreement with the Tool and Die Manufacturers Association, representing 26 plants in the Detroit area. There are about 60 tool and die shops in the area but the association is said to represent those accounting for 80 per cent of current production.

The new contract between the union and Briggs Mfg. Co. is now in effect after the executive board of Briggs Local No. 212 authorized signing of the contract following favorable vote of the local's mem-

bers. In accepting the new contract members had sent their committee back to seek elimination of a no-strike clause and addition of a provision insuring a minimum wage. The company is reported to have refused to make the concessions in the contract but the union's executive board accepted the contract in return for assurance that the company contemplated no reduction in wages.

Saginaw Will Make Tools For Parts Manufacture

Saginaw Steering Gear division of General Motors Corp. will make all tools required in production of its parts for 1939 models in its own tool room this year, according to Alva W. Phelps, plant manager.

Since 1935 the division has made only a small part of its own production tools, obtaining the majority from tool jobbing plants. The change will make nearly double the amount of work available to employees in the tool making department, which was given as the reason for the change.



"For Greater Safety" is the name of a new circular issued by Lewis-Sheppard Co., manufacturers of material handling equipment.*

Physicists Research Co. has released a bulletin on its profilometer, an instrument for measuring surface roughness.*

The Landis Tool Co. has just issued a new catalog (No. N-38) covering the Landis 16-in. type D hydraulic crank pin grinder.*

Condor whipcord V-belts are described in a bulletin released by the Manhattan Rubber Mfg., division of Raybestos-Manhattan, Inc.*

A profusely-pictured 36-page catalog describing the Homo method for tempering and related equipment has been prepared by Leeds & Northrup Co., Philadelphia.*

Worthington Pump and Machinery Corp., Harrison, N. J., recently published a 36-page booklet illustrating various installations of Diesel and gas engines.*

Definitions and descriptions of carbon steel plates and steel tubular products are set forth in two pamphlets recently issued by the American Iron and Steel Institute, 350 Fifth Ave., New York. The pamphlets comprise Sections 6 and 18 of the "Steel Products Manual." Copies are obtainable for 15 cents each.

An 8-page bulletin issued by the Foxboro Co., Foxboro, Mass., contains descriptions of Foxboro indicating pyrometers of the mono-pivot type, portable indicating pyrometers, and resistance thermometer indicators.*

* Obtainable from editorial department, AUTOMOTIVE INDUSTRIES, Address Chestnut and 56th Sts., Philadelphia.

Ford South American Rubber Now at 30,000 Acres

Henry Ford's rubber growing project, launched in the Amazon valley of Brazil in South America several years ago, as a means of making American tire and rubber goods manufacturers independent of British monopoly of crude rubber supplies, has progressed to the point where the Ford company now has approximately 30,000 acres of rubber plantations developed. More than 3,000,000 trees have been planted with 5,000,000 young trees in the Ford nurseries awaiting to be transplanted.

The Ford project includes two plantation sites—Fordlandia, in the State of Para on the right bank of the Tapajoz River, 112 miles from the city of Santarem, and Belterra, which is 31 miles from Santarem. At the close of 1937 the company had 12,849 acres occupied by its experimental plantation zone in Fordlandia, and 10,131 acres cultivated in Belterra.

The original Ford project was concentrated at Fordlandia and consisted of 4,939 square miles, but the Ford company exchanged 1,379 square miles for the Belterra site, through permission of the government of Para. In the Fordlandia experimental nurseries are 76 species of different rubber plants, each of which has revealed a large productivity of latex through three successive generations.

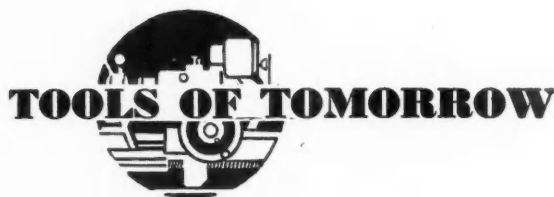
Although there are millions of untapped Hevea rubber trees in the Brazilian jungles, no attempt has been made to obtain their product, as Hevea Braziliensis in its wild state does not contain the same latex percentage that scientific production, with systematic cultivation can achieve, according to Humberto Monterio, sub-manager of the Ford company at Sao Paulo, Brazil.

At present rubber production in the State of Para is at the rate of 4,800 tons annually. The State of Amazonas is producing 6,000 tons a year. The rubber requirements of the Ford factories in the United States are 3,500 tons per month.

Transit Association Changes Convention Plans

The fifty-seventh annual convention of the American Transit Association, previously scheduled to be held in Atlantic City with an exhibit on September 19-22, will now be held without an exhibit at the Royal York Hotel, Toronto, Ontario, Oct. 3-6, inclusive.

May 21, 1938



Threading

... Landis machine has four threading units assembled on a single bed structure.

A threading machine has been built by the Landis Machine Co., Inc., Waynesboro, Pa., with four threading units assembled on a single bed structure. This equipment is said to have all the mechanical features of the company's Landmaco threading machine and, as pointed out by the manufacturer, the two additional threading units greatly increase production possibilities for certain classes of operations.

The new machine is equipped with a selective type gear box which provides eight threading speeds. Gears are cut from chrome-nickel steel and are hardened and burnished. Anti-friction bearings are employed throughout for all gear shafts. The main spindle is driven by a spiral bevel gear and is mounted on a pre-loaded anti-friction bearing at the die head end. Guides are covered by telescoping steel guards which protect them from chips and, in addition, wipers are provided at the rear of the carriage to reduce the possibility of chips working under the carriage and causing excess wear of the guides.

Gear Measuring Blocks

... Illinois Tool Works' Development for Use in Conjunction with Micrometers

Gear measuring blocks to be used in conjunction with micrometers have been developed by the Illinois Tool Works, Chicago. They are said to provide a simple and accurate

means of checking the pitch diameter and tooth thickness of spur or helical gears of either involute or stub tooth systems.

Each set consists of three blocks, two males and one female, and is constructed for a specific pitch and pressure angle. Two male blocks are used for gears with an even number of teeth, and the combination of one male and one female for gears with an odd number of teeth.

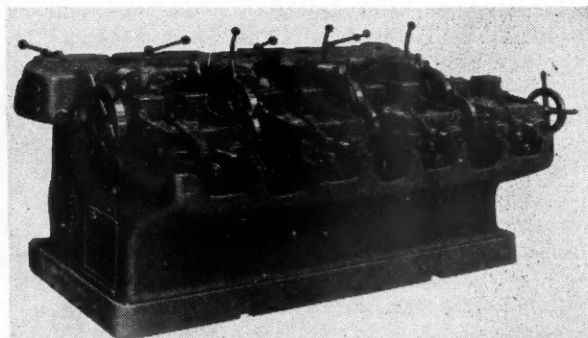
Adjustable Collet Chuck

... Universal Engineering Co.'s Unit for Holding Drills and Reamers on Hand and Automatic Machines

An adjustable collet chuck especially adapted for holding drills and reamers for both hand and automatic screw machines has been announced by the Universal Engineering Co., Frankenmuth, Mich. Feature of this chuck is that it can be adjusted to align the tool with the spindle, compensating for wear in the turret slides. Chucks are provided with keys so that the flanges can be set at right angles to the turret slide simplifying the correct setting of the tools. Should adjustment be necessary in two directions the keys can be removed.

The collets are the same type as have been used in the Universal collet chucks for holding end mills, woodruff keyway cutters and center points. A longitudinal adjustment of the drill itself can be made through the collet, and the drill can be set to any length desired. According to the maker, this chuck will hold the drill even though it is gripped on the flutes. In many instances it is

New Landis threading machine with four threading units assembled on a single bed structure



Automotive Industries

not necessary to cut off new drills where only short projection of cutting flute is required. The manufacturer also points out that this collet does not mar the shanks and in this way cause misalignment.

Goodrich-URW

(Continued from page 681)

"The recent construction of plants outside of Akron, embodying the latest engineering knowledge on layout and equipment, makes it difficult to maintain existing differentials so long as the advantage in equipment lies with the outside plants of the leading tire producing companies."

Estimating that from February, 1937, to February, 1938, there was a decrease of 18,000 jobs in tire and tube establishments throughout the United States, Dr. Hinrichs concedes that "there has been a loss in the competitive position of Akron in the last two years."

He presented a table of figures to show that while 68.4 per cent of all persons working in the tire and tube industry were employed in Ohio in 1935, this figure had dropped to 62.3 per cent in July, 1937, and to 58.7 per cent in February, 1938.

With man-hours per week averaging 20.4 in Ohio in February, 1938, as compared to 28.7 hours in other states, the number of man-hours worked in Ohio was only 55.2 per cent of the hours worked in the industry throughout the country in February, he estimated.

The decline in employment in Ohio during the year from February, 1937, to February, 1938, was 31.17 per cent as compared with 26.1 per cent for the industry as a whole and 16.4 per cent for other states, he found.

The decline in man-hours worked declined in the same period 57.5 per cent in Ohio and 35.1 per cent in plants outside Ohio, he said.

"Wages and labor costs are not synonymous. Often it will be found that particular low wage establishments operate at high labor costs. However, earnings data are the only materials available in detail for comparison of Goodrich operations with those of competitors," he said.

Hinrichs cited Goodrich figures on 1937 manufacturing expenses showing that labor represented 26.2 per cent. These proportions vary with the cost of raw materials, he pointed out, observing that "were the 1937 volume of business to be done at present material prices, labor costs would amount to about 30 per cent."

Tracing wage increases in Akron

from 1935 to 1937 as compared to outside areas, Hinrichs found that the Goodrich local at no time asked for a general wage increase.

When a general wage increase in February, 1937, added 8¼ cents an hour to average earnings in the Ohio-Michigan area, the B. F. Goodrich Co., in discussions with other Akron tire companies, "urged that the increase would create an unjustifiable differential," Hinrichs said.

Calendar of Coming Events

CONVENTIONS AND MEETINGS

National Battery Manufacturers' Association, Spring Convention, Cleveland	May 24-25
American Iron & Steel Institute Meeting, New York	May 26
SAE Summer Meeting, White Sulphur Springs, W. Va.	June 12-17
American Society for Testing Materials Meeting, Atlantic City, N. J.	June 27-July 1
National Petroleum Association Meeting, Atlantic City, N. J.	Sept. 14-16
SAE National Regional Fuel and Lubricants Meeting, Tulsa, Okla.	Oct. 6-7
SAE National Aircraft Production Meeting, Los Angeles, Calif.	Oct. 13-15
American Welding Society Meeting, Detroit	Oct. 17-21
SAE Annual Dinner, New York	Nov. 14
National Safety Council Meeting, Chicago	Nov. 14-18
American Petroleum Institute Meeting, Chicago	Nov. 14-18
National Industrial Traffic League Meeting, New York	Nov. 17-18
SAE National Production Meeting, Milwaukee, Wis.	Nov. 30-Dec. 1
Automotive Service Industries Show, Chicago	Dec. 5-10
*National Standard Parts Association Meeting, Chicago	Dec. 2-3

SHOWS

New York, National Motor Truck Show,	Nov. 9-15
New York, National Automobile Show,	Nov. 11-18
Pittsburgh, Pa., Automobile Show,	Nov. 11-18
Detroit, Mich., Automobile Show,	Nov. 11-19
Columbus, Ohio, Automobile Show,	Nov. 12-18
Buffalo, N. Y., Automobile Show,	Nov. 12-19
Chicago, Ill., Automobile Show,	Nov. 12-19
Milwaukee, Wis., Automobile Show,	Nov. 12-19
Minneapolis, Minn., Automobile Show,	Nov. 12-19
*Philadelphia, Pa., Automobile Show,	Nov. 12-19
*San Francisco, Calif., Automobile Show	Nov. 12-19
Los Angeles, Calif., Automobile Show,	Nov. 12-20
*Elmira, N. Y., Automobile Show,	Nov. 14-19
New Haven, Conn., Automobile Show,	Nov. 14-19
Baltimore, Md., Automobile Show,	Nov. 19-26
*Washington, D. C., Automobile Show,	Nov. 19-26
*Cincinnati, Ohio, Automobile Show,	Nov. 20-26
*St. Louis, Mo., Automobile Show,	Nov. 20-27
Newark, N. J., Automobile Show,	Nov. 26-Dec. 3
Denver, Colo., Automobile Show,	Dec. 5-10

*Tentative

Chevrolet Continues School For Dealers' Sons

The second Chevrolet School of Modern Merchandising and Management, for sons of Chevrolet dealers, was opened this week with 26 young men enrolled for the seven-weeks' course.

The course is under the supervision of T. O. McLaughlin and includes daily classroom sessions presided over by the heads of different departments, and inspection trips through the various Chevrolet manufacturing plants in and near Detroit. Students will visit also the General Motors proving ground at Milford, Mich., and the research laboratory in Detroit.

Canadian Tire Replacements

Canadian tire replacements have declined in ratio with the decline in the United States, and since 1930 have dropped from an average of 1.239 tires per car registered, to 0.974 per car for 1936, the last year for which data are available. Canadian production of pneumatic casings, largely controlled by American capital, has declined from 3,394,885 units in 1930 to 2,542,673 in 1936. Domestic sales were 2,051,528 in 1930 against 1,851,654 in 1936. The low point was 1,326,599 in 1933. Car registrations in Canada were 1,224,098 in 1930, dropped to a low of 1,051,231 in 1933 and in 1937 were 1,306,139.

Numerous large American tire manufacturers have subsidiary plants in Canada to gain the advantage of Canada's reciprocal tariffs with foreign countries.

Tire and Tube Excise Receipts

Treasury Department receipts under the tire and tube excise tax for March, 1938, were only 45.4 per cent of the total for March, 1937, while for the first quarter of 1938 receipts were 47.8 per cent of the similar 1937 period. The tire tax in the first quarter of 1938 was \$3,933,700, against \$8,418,000 in 1937; \$6,154,300 in 1936 and \$4,699,500 in 1935. The tube tax was \$891,200 in the first quarter of 1938, against \$1,661,300 in the first quarter of 1937; \$1,237,000 in 1936 and \$1,124,300 in 1935.

The excise tax is 2¼ cents per pound on tires and 4 cents per pound on tubes. Total excise tax paid in 1937 was \$33,500,200 on tires and \$6,587,600 on tubes.



In order to give readers of **AUTOMOTIVE INDUSTRIES** a clue to certain merchandising and service aspects of the automotive industry which are normally outside the scope of an industrial publication, we present herewith excerpts from the May issues of the four other magazines published by the Automotive Division of the Chilton Co.: *Automobile Trade Journal*, *Commercial Car Journal*, *Motor Age*, and *Motor World Wholesale*.

From MOTOR AGE

If speed returns this year to the site of the two battles for the modern Vanderbilt Cup on Long Island, N. Y., it will be in the form of a 250-mile race on a track shorter than the abandoned Roosevelt Raceway.

Prediction in last month's MOTOR AGE that there likely would not be another George Vanderbilt Cup Race on the pretzel road race course was confirmed by the contest board of the AAA, national governing body of the sport. The AAA removed the scheduled 300-mile international event, listed for July 5, from its calendar and prepared to select its 1938 national champion from the 500-mile International Sweepstakes on the Indianapolis Speedway on May 30 and the 100-mile national championship classic at Syracuse, N. Y., on Sept. 10.

From COMMERCIAL CAR JOURNAL

While other manufacturers with package delivery models have been concerned with getting the engine under the seat, between the seats and under the floor, comes word that one of the industry's best known truck names will shortly have a package job with the engine back of the driver's seat. There will be a number of models, all of
(Turn to page 702, please)

May 21, 1938

Fifty Pounds of

By H. E. BLANK, JR.

FIFTY pounds of copper went into each of the more than 5,000,000 passenger cars and trucks produced in 1937, according to the Copper and Brass Research Association, which estimates the automotive industry's consumption for last year at approximately 250,000,000 lb. While changes in design practices and in manufacturing methods have resulted in both gains and losses in the amount of copper used for various automobile parts, the total weight of the metal in the "average" car has remained virtually unchanged for many years, so that the automotive industry continues to be the copper producers' second largest market.

Many different automobile parts are being made today from copper and copper alloys, and a partial list will be found on the next two pages. Among the new developments which have added to the amount of

copper in the "average" car are the different types of automatic and remote-control gear shifting devices offered on 1938 models. Many of these mechanisms require considerable amounts of copper in the form of wiring and magnet coils. There is also more copper in the electric generators of the latest models, be-



Rolling a brass strip to finished gage in four high rolling mill

Photo courtesy of the American Brass Co.

Automotive Industries

f Copper

In the average vehicle places the automotive industry next to the largest user of copper and its alloys.

cause of the increase in power needed to operate car radios, heaters, electric horns, and other devices. Large amounts of copper tubing and wiring go into car heaters. Radios, of course, require copper for wiring, aerials, and related parts. About one-third of the copper in an automobile goes into the radiator.

Comparatively recent developments in automotive practice involve the use of copper in such parts as cylinder heads, and as an alloying element in the materials used for camshafts, crankshafts, pistons, brake drums, valve push rods, and valve-seat inserts for aluminum cylinder heads. It has been claimed that advantages can be gained by copper plating the combustion chambers in cast-iron cylinder heads, one author stating that "promising results in suppression of detonation have been reported for the use of an electrodeposit of copper about 0.005 in.

thick on cast-iron combustion chambers, provided that good adhesion of the plating is secured."

Copper plating is used as an undercoat for chromium on zinc die-cast radiator grilles, and it is sometimes considered an advantage to

copper plate steel-to-steel parts which must withstand severe pressures in service, including camshafts, rear axle drive gears, steering gear cams and followers, valve tappet and valve-stem surfaces. Certain portions of parts to be case-hardened may also be copper plated where carburizing is not desired. Copper for plating may be used in the form of copper ball anodes, such as those made by the Udylyte Co., Detroit.

The advantages claimed by the company for its product are that constant anode area is maintained at all times, that scrap losses are eliminated, and that the ball anodes are convenient to use. In copper cyanide plating it seems that insufficient anode area results in sludge formation from the anode. The presence of sludge in the bath will produce "rough copper" with imperfections

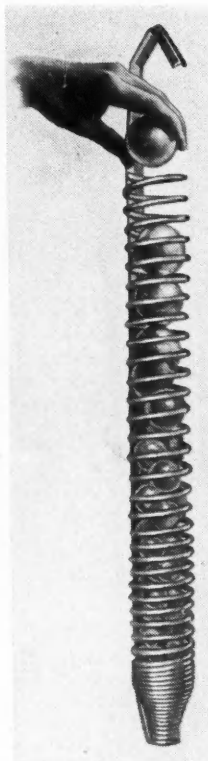


General view of casting shop of the American Brass Co.

Automotive **15**
Materials

reproduced through all successive deposits, impairing the appearance of the plate as well as the protective qualities of the coating. Another reason advanced in favor of ball anodes is that they keep the metallic content of the bath uniform at all times.

The Federal-Mogul Corp., Detroit, has pioneered much of the development work on copper-alloy cylinder heads and the results of its early experimental efforts carried on in cooperation with the Battelle Memorial Institute were described in *AUTOMOTIVE INDUSTRIES*, Oct. 20, 1934. Details on a new Federal-Mogul replacement cylinder head were also published in *AUTOMOTIVE INDUSTRIES*, April 2, 1938. As set forth in the more recent article, the chief virtue of the new head is its "ability to produce combustion chamber temperatures approaching what is considered good engine condition for various throttle openings (about 500 deg. Fahr. at wide-open throttle)." Other advantages of the copper-alloy cylinder head described in the article include increased compression ratio, minimum "pinging" with regular fuels, and instantaneous



Container and ball-type anodes made by the Udylyte Co. for copper plating

cold-weather starting with minimum choking. The manufacturer states that the new head will not corrode, and that failure because of overheating, freezing or sudden chilling is eliminated due to its high coefficient of expansion. Federal-Mogul also uses copper in many of its other products, such as bushings and copper-lead bearings.

Most of the copper supplied commercially in the United States is electrolytic copper—a metal, 99.90 per cent pure, which may be drawn, forged, formed, soldered, stamped, and welded. It has several properties that are highly desirable for many automotive applications, principally excellent corrosion resistance and high electrical and thermal conductivity. There are several modified forms of the metal, including Lake copper, arsenical copper, beryllium copper, cadmium copper, and phosphorized copper.

Lake copper, otherwise known as argentiferous copper, contains silver in amounts ranging from 4 to 12 per cent. The silver in the copper tends to raise its softening temperature. This is an advantage, in that it tends to prevent annealing of parts—as in

Brass and Bronze Alloys for

SAE No.	Alloy	Copper Content	Applications
40	Red Brass	84.00-86.00	Water-pump impellers; fittings for gasoline and oil lines; small bushings; small miscellaneous castings.
41	Yellow Brass	62.00-67.00	Radiator parts; fittings for water-cooling systems; battery terminals; miscellaneous castings.
42	White Nickel Brass	55.00-64.00	Control brackets, levers, etc., to match nickel-silver trimmings and fittings on motorboats.
43	Manganese Bronze	55.00-60.00	Gear-shifter forks; counters, spiders; brackets and similar fittings; parts for starting motors; landing-gear and tail-skid castings for airplanes.
44	Brass to be Brazed	83.00-86.00	Fittings for water-pipes which are brazed.
45	Brazing Solder	48.00-52.00	For brazing.
62	Hard Bronze	86.00-89.00	Gears; bearings; bushings for severe service; valve guides; valve-tappet guides; camshaft bearings; fuel pump, timer and distributor parts; connecting-rod bushings; piston pins; rocker lever; steering sector and hinge bushings; starting-motor parts.
63	Leaded Gun Metal	86.00-89.00	Bushings and bearings; fittings for moderately high water or oil pressures.
64	Phosphor Bronze	78.50-81.50	Wrist pins; piston pins; valve rocker-arm bushings; fuel and water-pump bushings; steering-knuckle bushings; aircraft control bushings; resistance to wear and scuffing.
640	Nickel Phosphor Bronze	85.25-87.75	Cones of synchronizer gears.
66	Bronze Backing for Lined Bearings	83.00-86.00	Main bearings; connecting-rod bearings.
660	Bearing Bronze	81.00-85.00	Bushings for torque tubes; steering knuckles; piston pins; spring eyes. Thrust washers.
67	Semi-Plastic Bronze	76.50-79.50	Water-pump bearings.
68	Aluminum Bronze		
	Grade A	87.00-89.00	Valve seats; worm wheels; gears; valve guides and forgings.
	Grade B	89.50-90.50	
70	Commercial Brass Sheets		
	Grade A	68.50-71.50	General purposes; gasoline tanks; oil tanks; radiator shells; trim rods; pipe; rivets; water-jacket plates; flat springs; deep drawings and stampings.
	Grade B	66.00-69.00	
	Grade C	64.50-67.50	

Extruding round brass rods. Three rods are being extruded at one time in the press at the right and wound into coils. One coil is shown being wound on the left, the other two coils which are being wound on similar machines are not shown



Photo courtesy of the American Brass Co.

the case of automobile radiator cores, which are immersed in molten solder during the manufacturing process. Corrosion resistance and electrical and heat conductivity are practically the same for both electrolytic and Lake coppers.

Phosphorus is sometimes added to copper to remove oxygen, which is the principal impurity. The phosphorized copper is exceptionally ductile and, although its electrical conductivity is lower than that of electrolytic, it is more widely used for tubing because of its superior drawing and coiling qualities.

The presence of approximately 0.4 per cent arsenic in copper tends to improve fatigue and tensile strengths. Arsenical copper also retains strength better at elevated temperatures, and the presence of arsenic seems to assist in the formation of protective oxidized coatings. A negative effect of the addition of

0.4 per cent arsenic is the reduction of conductivity to 50 per cent of that of electrolytic copper.

Cadmium copper and beryllium

copper have the highest tensile strengths of any of the coppers mentioned. Beryllium, in fact, surpasses the cadmium copper in this property.

Automotive Applications

SAE No.	Alloy	Copper Content	Applications
71	Copper Sheets	99.50	Minor parts such as connectors and terminals; cover plates; radiators; fittings on wing beams and struts.
72	Free Cutting Brass Rods	60.00-63.00	Small screw-machine parts; pins; nuts; plugs; screws; valve disks; valve caps.
73	Naval Brass or Tobin Bronze Rods	59.00-62.00	Forgings; water-pump shafts; gears; gear bearings; propeller shafts; studs and nuts; bushings; turn-buckle barrels; adjusting strut-ends; valve-stem bushings; screw-machine parts.
74	Annealed Seamless Brass Tubing		Brass water-pipe; ignition tubes; foot-rest bars; radiator attachments and spacers; heaters; lighting plants.
	Muntz Metal	59.00-63.00	
	High Brass	65.00-68.00	
	Red Brass	84.00-87.00	
75	Copper Tubing	99.90	Oil and fuel lines; oil-gage tube in lighting plants.
76	Naval Brass or Tobin Bronze Tubing	59.00-61.00	Bushings and bearings for starting motors and lighting plants.
77	Phosphor Bronze Strips		
	Grade A	95.00 approx.	Friction plates in clutches; thrust washers; small springs; contact springs.
	Grade B	95.00 approx.	Contact supports and springs; starting-switch springs.
79	Red Brass Sheet		Radiators; lamp shells; special drawing purposes.
	Grade A	83.00-86.00	
	Grade B	79.00-82.00	
80	Brass Wire		
	Grade A	70.00-74.00	General purposes for springs; also for wrapping turnbuckles and locking wire.
	Grade B	64.00-68.00	Minor springs.
81	Phosphor Bronze Wire	95.00 approx.	Safety wire for fastening nuts and bolts. Also see S.A.E. No. 80.
82	Brass Wire	59.00-62.00	Electrical purposes; wire and cable.
83	Soft or Annealed Copper Wire	(high purity commercial copper)	Forgings; screws and studs.
88	Brass Rods	58.50-61.50	

Data from 1938 Handbook, Society of Automotive Engineers.

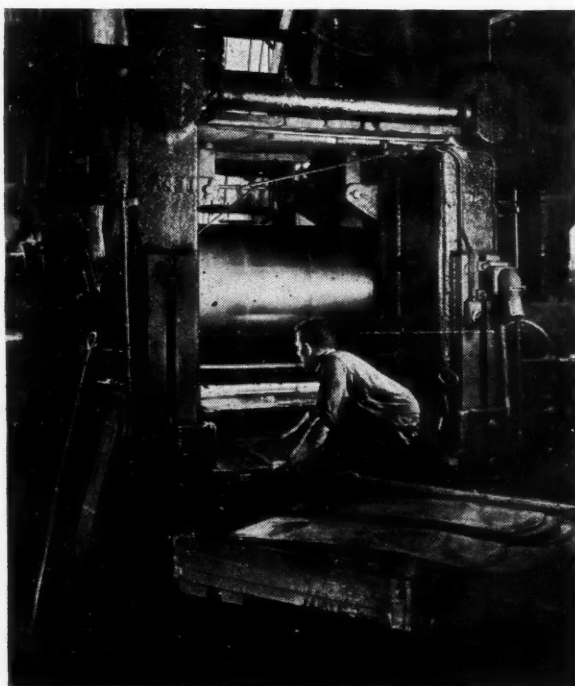
When 2 per cent beryllium is added to copper, both tensile strength and hardness are enhanced, and the metal retains good ductility and high conductivity. This metal is reported to have a tensile strength exceeding 160,000 lb. per sq. in. when heat-treated after being work-hardened. Another characteristic of beryllium copper that is eminently desirable in certain applications is its high fatigue limit when exposed to corrosive conditions.

The principal use for unalloyed copper in the automobile is, of course, in the electrical equipment. The high-conductivity copper used for this purpose is virtually free of impurities and usually annealed. Specifications establish the electrical resistivity of 100 per cent conductivity copper as 0.69150 microns per in.-cube at 68 deg. Fahr. maximum.

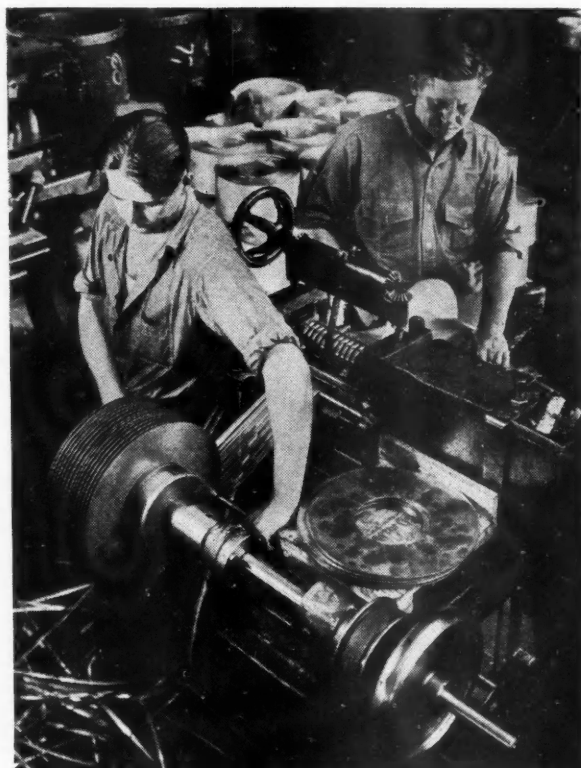
Annealed copper is very soft and adapts itself readily to surface irregularities. Its relatively high resistance to tearing accounts for its use—usually in combination with asbestos—for cylinder-head and other gaskets in automotive engines. Other applications for copper in annealed form include engine fuel and oil pipe lines and also pipe lines for hydraulic braking systems.

In a recently published article on copper and its alloys in automobile design, D. P. C. Neave¹ comments; "Annealed copper quickly hardens up when worked or bent, so that when subjected to the minute local flexures of service, the material raises its own 'proof stress,' with the result that the fatigue limit of copper in-

itally annealed is actually about plus or minus $4\frac{1}{2}$ tons per sq. in. When hardened by rolling or other working prior to installation so that it has a tensile strength of, say, 25 tons per sq. in., copper has been reported to exhibit higher fatigue limits, up to about plus or minus 8 tons per sq. in., but the metal is then considerably more sensitive to local overworking, as by bending during fitting."



Rolling wide brass sheets



Photo, Courtesy the American Brass Co.

Brass is a binary alloy of copper and zinc, the composition ranging from approximately 95 per cent copper and 5 per cent zinc to 55 per cent copper and 45 per cent zinc. In general, brasses have higher ductility than comparable copper-tin alloys or bronzes, and are not quite so hard. When zinc is alloyed with copper in an amount greater than 45 per cent, the resulting metal is very brittle. However, within the analyses ranges noted, brass is malleable and can easily be cold-worked. Although it hardens when worked cold, it can be annealed without difficulty.

The metallurgical aspect of alloying varying proportions of copper and zinc was discussed recently by R. A. Wilkins², who stated: "Brasses having from nearly 100 per cent down to 64 per cent copper are structurally a single-phase solid solution of zinc and copper. This is termed the 'alpha' phase. Below 64 per cent copper, a second or 'beta' phase appears, and the commercial alloys ranging from this copper content downward exhibit a mixture of the two phases and are known as the 'alpha-beta' brasses. As the copper content decreases, the beta phase predominates and the alloys rapidly be-

¹ "Copper and Its Alloys in Automobile Design," by D. P. C. Neave, general manager of the Copper Development Association, London.

² "Copper and Copper-Base Alloys," by R. A. Wilkins, Revere Copper and Brass, Inc.

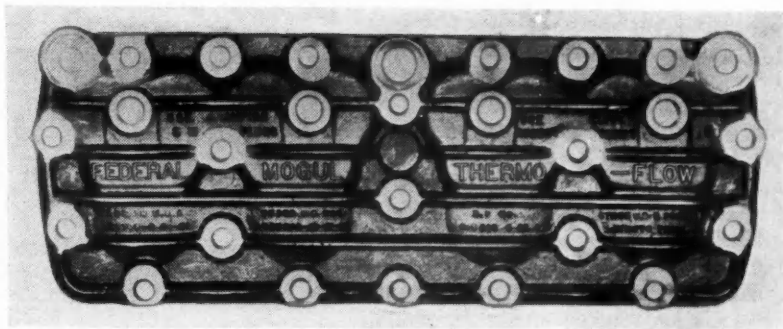
come brittle and valueless structurally. In the binary copper-zinc alloys the maximum ductility will be found in the alloys having in the neighborhood of 70 per cent copper, and the maximum strength will be found in the alloys having from 60 to 63 per cent copper, in which latter case the beta constituent is effective in hardening and strengthening the alloy."

Lead is sometimes introduced into brass to improve its machineability. Strength and hardness can be increased by alloying tin with the metal and, for alpha-beta brasses, the same ends may be achieved by adding manganese and iron. Lead, manganese, and iron all tend to lower slightly the resistance of the alloy to corrosion. On the other hand, tin or aluminum alloyed with brass definitely boosts resistance to certain types of corrosion, while having little or no undesirable effect on the other properties of the metal.

Generally, the brasses are susceptible to those corrosive influences which have an adverse effect on copper, and in addition, they will be attacked by certain corrosive agents which do not have any deleterious effect on copper.

Brass containing less than 85 per cent copper, when exposed to acidic media, is susceptible to a type of

failure termed "dezincification." This is made manifest by the appearance of spongy areas on the exposed surface of the metal. An exception is found in Admiralty metal, which contains 70 per cent copper, 29 per cent zinc, and 1 per cent tin. The tin addition seems to lessen the tendency toward "dezincification." Small
(Turn to page 706, please)



Copper-Alloy "Thermo-Flow Power Head" made by the Federal-Mogul Corp. for Ford V-8 engines

Automotive *Materials*

NEW DEVELOPMENTS

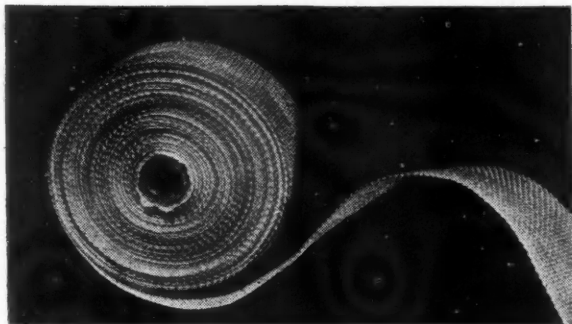
Electrical Insulating Tapes Woven from Glass Yarns

Electrical insulating tapes, woven from glass yarns, are a recent development of the Corning Glass Works, Corning, N. Y. These tapes are said to have the appearance and flexibility of ordinary textiles and are intended for the insulation of coils for motors, generators, transformers, and for cables and other electrical conductors.

As they are made of glass, their electrical properties and chemical re-

sistance are unusually high. They also will withstand temperatures in excess of the limits specified for class B high-temperature insulation. Further, they impregnate readily with resins, gums and varnishes to form an insulation impervious to moisture and of high dielectric strength.

The flexibility and textile properties of these tapes are obtained from the extreme fineness of the glass fibers, which is from 1/15 to 1/20 the diameter of a human hair.



New electrical insulating tape developed by the Corning Glass Works

"True" Soya Bean Plastic

In a research program designed to develop a soya bean plastic entirely from soya sources, considerable progress has been made at the United States Regional Soyabean Industrial Products Laboratory at the University of Illinois, Urbana, Ill. This work is being done under the direction of Dr. O. E. May, and has been under way for about a year.

Although the Ford Motor Co. has long been in commercial production on what is termed a soya plastic, this is known to be in reality a modified phenolic plastic, as the reaction by which it is formed involves the use of phenolic materials which contribute largely to the formation of the resinous binder, although the protein in the soya meal used is understood to form part of the binder. The remainder of the soya meal contributes to the filler but is supplemented with wood flour, such as is used in making conventional phenolic plastics.

The Government project has for its

objective the production of a true protein plastic from soya bean protein and soya bean meal, without the supplemental reaction with phenol and/or formaldehyde. A moldable plastic has been made on an experimental scale, but details as to the process and the characteristics of the material produced are not yet ready for publication.

Work in the laboratory mentioned above is prosecuted under the Industrial Farm Products Division of the Bureau of Chemistry and Soils, U. S. Department of Agriculture.

At present, the only commercial plastics based on protein are those of the casein type (derived from milk) now confined almost entirely to the making of buttons and not used in automotive products. This excepts the Ford plastic in which the protein is not of major importance.

Of much greater significance than soya plastics to the automotive industry at present is the use of soya oil in the manufacture of enamels for car finishing. These oils are the primary product of the Ford process. There are, in addition, derived in the Ford process, oils which enter into shock absorber fluid and some which are used as binders in making foundry cores. Soya meal used in the Ford plastic (as well as in the Government process referred to) is a residue of the oil extraction process, but is rich in protein serviceable in the making of plastic materials.

Both the Ford and the Government projects are designed in large part to promote more extensive use of farm products by industry. It is expected that the shortage of Tung oil resulting from the war in China, whence most of the supply is derived, will increase the demand for soya oil, although the two have somewhat different characteristics. Both are used extensively in making automotive and other finishes.

Molding Compound For Parts with Large Inserts

A new molding compound has been announced by General Plastics, Inc., North Tonawanda, N. Y., to be known as 2274. This material was developed to meet the problem of molding parts with especially large inserts which are subject to extremes of temperature.

While this compound is comparable with standard compounds, the final set is slightly more flexible. Therefore, it is claimed that cracking is avoided in the finished piece which otherwise occurs with expansion and contraction of the metal inserts.

Development of Cellulose-Base Artificial Fibers

Great progress has been made during the past several years in the development of cellulose-base artificial fibers for use in cotton and wool mixtures for fabrics, and even alone in fabrics which are similar in their properties to cotton and wool fabrics. Developments in this line in Germany during the past 17 years are reviewed in an article by Wilhelm Eller which appeared in *Chimie & Industrie*.

Before the World War, Germany had a large textile industry which was dependent for its raw materials largely on foreign sources. During the war, when these sources of supply were shut off, the suggestion was made to supply the cotton mills with rayon fibers cut to length. Spun yarns were made from these fibers, and textiles made therefrom were used for clothing—the paper suits of which a good deal was heard during and immediately after the war.

These yarns, however, had serious disadvantages, and they disappeared from the market shortly after the war, when cotton and wool were available again in adequate quantities. Only one of the companies that had produced these artificial fibers during the war period, the Köln-Rottweil Co., continued its research work, and in 1920 produced the artificial fiber Vistra, which in the course of time became the basis of the artificial textile fiber industry in Germany. The early product left a

good deal to be desired, and that the business did not prosper particularly would seem to be indicated by the fact that in 1926 the Köln-Rottweil Co. was taken over by the I. G. Farbenindustrie Co., the German dye trust. In recent years development of artificial fibers of a cellulose base has been greatly stimulated by the foreign exchange situation in Germany. Not possessing the necessary foreign exchange with which to buy foreign raw materials for its industries, Germany was forced to develop home sources of raw materials.

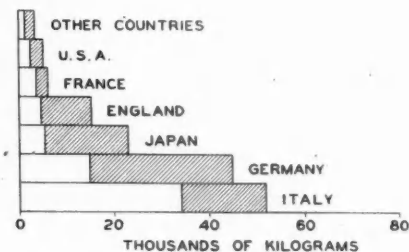


Fig. 1 — Production of cellulose artificial fibers in 1935 (white bars) and increase in production in 1936 (shaded bars) in different countries

The easiest part of the problem evidently was to produce a substitute for cotton. Since the artificial cellulose fibers have the same cellulose base as cotton, their physical properties are much the same, and it is possible to produce from the artificial fibers finished products having the same characteristics as cotton textiles, and artificial cellulose and cotton fibers may also be mixed at will.

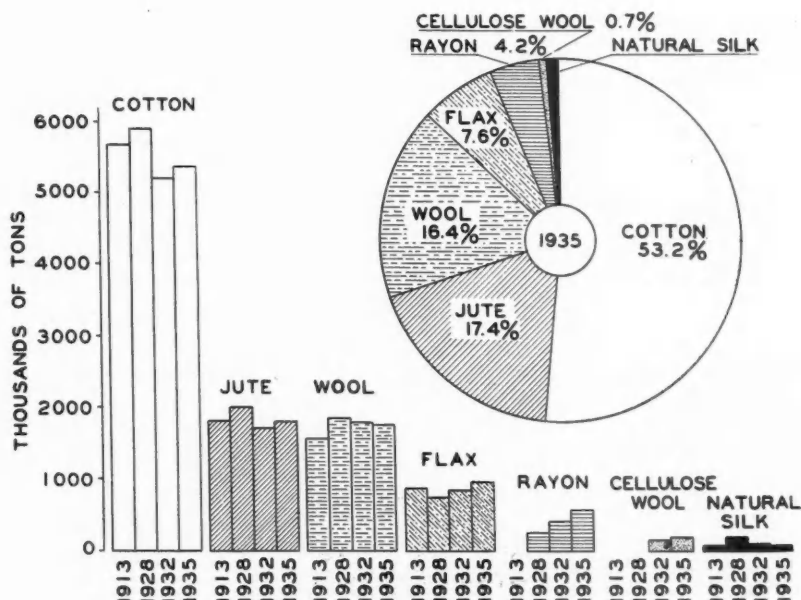
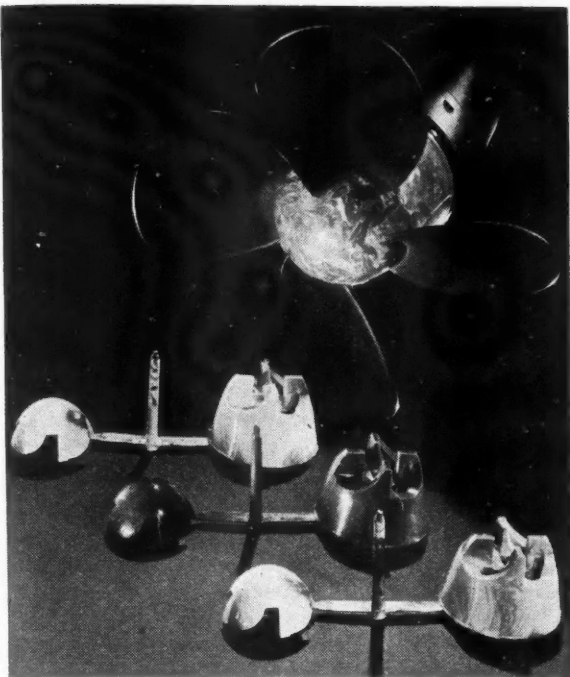


Fig. 2—World production of the principal textile raw materials in 1935 and changes in production of such materials over a span of years



Excel Auto Fan with injection-molded Tenite hub parts, some of which are shown in the three "gates" as they come from the mold

For a year and a half now all cotton yarns of medium weight (between Nos. 12 and 50 on the English scale) are being prepared in Germany with artificial fiber additions, ranging from 16 per cent up. These yarns have been favorably received by the cotton mills, and the fabrics are liked by the public, on account of their uniformity and their attractive sheen. At first the artificial fiber did not have nearly the same strength as cotton, especially when wet, but this disadvantage is gradually being overcome.

Substitution of artificial fiber for wool came at a later date, and was attended with greater difficulties, especially in connection with the dyeing processes. In order that they may be successfully mixed with wool, the artificial fibers must be of approximately the same thickness as wool, so that the spinning properties are the same; and they should also have approximately the same tensile and elastic properties, the same degree of curling, and the same surface structure; finally, it must be possible to "fuller" the fibers.

The latest product of I. G. Farbenindustrie, known as Vistra XT, is said to meet these requirements. It is claimed to have substantially the same waviness or curliness as natural wool, and to retain it while being dyed and finished, and also while being worn. In the shrinking process, mixed fibers containing Vistra XT are said to behave exactly like pure wool.

The artificial-textile fiber indus-

try is not confined to Germany by any means, and has attained even greater importance in Italy, while large quantities of the fiber are produced also in Japan and England. Production volumes in the different countries in 1935 and increases in production in 1936 are shown in Fig. 1, while Fig. 2 shows world production of the principal textile fibers for 1935 and the changes in the production of these fibers over a term of years.

In closing his article, the author expresses the opinion that artificial textile fibers will take their place among other textile raw materials; they will enrich the chemical industry, enrich textile production methods, and offer new possibilities in the fields of tailoring and fashions, as well as in other branches of the textile industry. Whether the artificial fibers are being used in automobile upholstery materials in Germany is not mentioned.

Injection Molded Parts for Defogging Fans

Molded rubber blades have gained extensive use in small fans for defogging windshields, partly because they do not require metal guards. Various methods of fastening the blades to the hub have been employed. One of the latest, used in the Excel Auto Fan, is to apply injection-molded parts for this purpose. Two of these parts are required and they are molded simul-

taneously in a two-cavity mold by the Elmer E. Mills Corp. The cellulose acetate plastic, Tenite, is employed and, as in making other injection molded parts, is fed into a cold mold after heating to reduce it to a plastic state.

As can be seen from the three "gates" of moldings shown in the accompanying illustration, the plastic enters the mold through a central sprue and passes then through runners to fill each of the cavities. Sprue and runners are ejected from the mold with the moldings, of course, and are easily broken off from the latter and reused along with new molding material. Each of the moldings contains a small brass insert, that in the latter forming a hub into which the fan shaft fits and that in the cap casting being threaded to facilitate fastening of the hub.

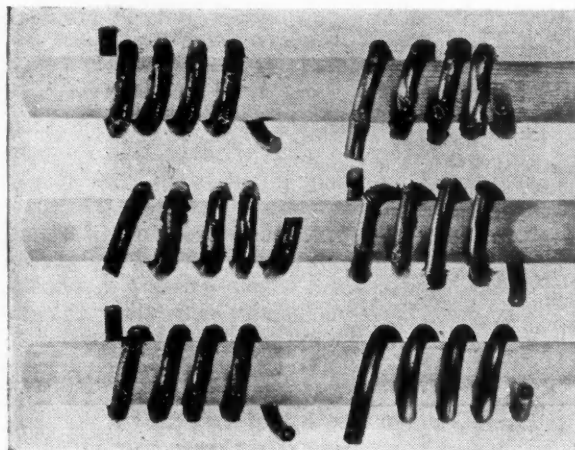
In assembly, the molded blades are anchored in the slots molded in the larger hub piece, the molded cap is put in place and a screw applied to hold the parts in their respective positions, making a quick and neat assembly. No applied finish is required on the molded parts, as they come from the mold with a high luster and can be made in any one of several solid colors or in mottled effects, which add to the pleasing appearance of the unit.

To Introduce New Free-Cutting Steel

A new open hearth steel that is reported to have 20 to 50 per cent better machineability is soon to be introduced on a commercial basis by the Inland Steel Co.

For a number of years Battelle Memorial Institute and the Research Division of Inland have been cooperating on the problem of developing an open hearth steel that will have the machineability of Bessemer steel and still retain the superior physical properties of open hearth steel. For several months the new steel has been supplied to a few producers of cold drawn bars who, in turn, have cold finished it for a limited group of customers for testing.

The steel has been tested in all types of machining and has showed a marked superiority in machineability not only to open hearth steel but to Bessemer screw stock. Faster production has been obtained. Large numbers of physical tests and heat-treating tests are claimed to have demonstrated that this new steel has the same physical properties and can be heat-treated in the same manner as regular steels of the same analysis.



Tested samples of ignition cable showing excellent condition of cable with neoprene sheath which appears at lower right

The tests on this steel in higher carbon analyses indicate the possibility of making steels that are truly "free machining" in these carbon ranges.

When used with sulfur in the usual screw machine grades the new steel gives unprecedented machinability. When used with low sulfur in other grades the machining properties of screw stock and the physical properties of the low sulfur steels are obtained.

Ignition Cable Protected By Neoprene Jacket

The insulated wire industry has developed an ignition cable protected by a special neoprene jacket that will resist the deteriorating effects of ozone, heat, oil, grease and chafing. A series of tests were conducted recently by the Packard Electric Division, General Motors Corp., on a cable of this type manufactured by them.

A sample of the cable, together with five different samples of ordinary cable were first submerged in oil at 200 deg. Fahr. for 24 hours. Next, the six samples were placed in an oven where the heat was held at 210 deg. Fahr. for 76 hours. This was followed by another submergence in oil at 200 deg. Fahr. for 24 hours. Then the six samples were placed in salt water at room temperature for 24 hours. Finally, they were returned to the oven where they were kept at 250 deg. Fahr. for 15 hours.

After each successive stage of the test the samples were wrapped on 1-in. mandrels to test for flexibility. All cables except the one protected with neoprene and one other sample cracked after the second stage of the test. This latter sample cracked after the fifth test, while the neoprene-jacketed cable maintained its orig-

inal appearance and flexibility and showed no signs of cracking even when bent on a 1/2-in. diameter mandrel after the test.

Other samples of the same cable were also subjected to an electrical test. Three of these samples failed at 10,000 volts and two failed as soon as the voltage was raised to 15,000. The neoprene covered cable withstood 10,000 volts for one hour, 15,000 volts for one hour, and 20,000 volts for three minutes.

Actual service tests comparing the several types of cable are reported to have confirmed the accuracy of these results.

New Acetate Molding Materials

New acetate molding materials have been developed by the Bakelite Corp., New York. The Bakelite acetates are thermoplastic molding compounds with a cellulose acetate base and are recommended by the manufacturer for both injection and compression molding. They are made

Arc Welding Brass to Steel Solves Conveyor Problem

Conveyor racks to carry finished engine parts such as machined crankshafts, connecting rods and camshafts must be built in such a way and of such materials so that the parts carried will not be scratched or marred in transit. Engineers of the Palmer-Bee Co., Detroit, have worked out a design for conveyor racks which is said to have proved entirely satisfactory.

The new method of construction, instead of utilizing solid brass hooks to hold the conveyed materials, as was former practice, employs brass only at the contacting surfaces. The hooks are composed of a steel base with a strip of brass around the outer surface. Welding brass to steel was made possible by the development of a new arc welding electrode called "Aerisweld." This electrode is of the shielded arc type and was developed by The Lincoln Electric Co., Cleveland, Ohio, particularly for arc welding brass. It is used also for welding copper and bronze.

In constructing one of the racks, four pieces of steel, in the shape of a hook, are electrically welded to the rack frame. A strip of brass is elec-

in granular form in a wide range of colors, including crystal clear, black and variegated mottles. They are also available in transparent, translucent and opaque colors.

The following data are applicable to the normal commercial range of these new materials:

Physical (Molded)

Specific Gravity	1.27-1.50
Impact Strength, Energy to break test piece	0.4-1.8 ft.-lb.
Tensile Strength	3000-6500 lb. per sq. in.
Transverse Strength	6000-7000 lb. per sq. in.
Molding Shrinkage	0.0025-0.008 in. per in.
Heat Distortion	120-195 deg. Fahr.
Softening Point	180-250 deg. Fahr.
Hardness, Rockwell	80-120
Refractive Index	1.47-1.51
Light Transmission (Crystal)	80-90 per cent

Chemical Resistance (Molded)

Water Absorption, 96 hours at room temperature 1.5-3.0 per cent
Solvents:—Soluble in ketones and esters, such as acetone, ethyl acetate, Cellosolve; Affected slightly by alcohol.

Insoluble in hydrocarbons, such as benzene, toluene, styrene, carbon tetrachloride, oils.

Note: Elevated temperatures influence the action of both solvents and non-solvents inducing swelling.

Dilute Acids and Alkalies . . . slight effect

Concentrated Acids and Alkalies . . . decomposes

Electrical (Molded) (A.S.T.M. Procedure)

Unchanged
Resistivity . . . 1×10^6 - 10^8 megohm centimeters

	60 cycles	1000 cycles	10 ⁶ cycles
Power Factors	0.01-0.04	0.020-0.060	0.035-0.060
Dielectric Constant	4.9-6.2	4.5-6.0	4.0-5.0
Loss Factor	0.05-0.25	0.17-0.36	0.14-0.30



Palmer-Bee conveyor racks fabricated by new economical method which provides non-scratching attachment surfaces for carrying machined engine parts

trically welded to the steel, using "Aerisweld" electrode. This strip extends over the entire supporting surface of the upper two hooks (see illustration) to assure protection, in case a crankshaft is bumped against the bottom of the hook in loading. The strip on the lower hooks covers the top and front surfaces.

In welding the brass strip to the steel, the "Aerisweld" electrode is employed with positive polarity, that is, the electrode is made positive and the work negative. The welds are said to have good tensile strength with the characteristics of true phosphor-bronze.

Data on "Non-Sparking" Beryllium Copper

A letter from the Beryllium Corporation of Pennsylvania comments as follows on the item referring to the "non-sparking" characteristic of beryllium copper which appeared in the March 26, 1938 issue of *AUTOMOTIVE INDUSTRIES*:

"The term 'non-sparking' as applied to beryllium copper was coined as a descriptive sales term some years ago by suppliers of bronze tools for use in the presence of highly inflammable vapors or liquids. It has long been recognized by safety engineers that the use of bronze tools in place of steel minimized the chances of obtaining friction sparks in such hazardous locations.

"When beryllium copper was introduced early in 1932 it was soon recognized that the high physical properties of this heat treatable alloy would make a superior hand tool for work of this nature. Containing approximately 98 per cent copper, it was readily appreciated that the al-

loy itself would not spark and could, therefore, be called 'non-sparking.' Many laboratory tests have confirmed this.

"However, when applied to any non-ferrous tool, whether bronze or beryllium copper, the term 'non-sparking' is probably a relative one. It is, of course, possible that even though a hammer itself does not spark there is a slight chance that a particle of ferrous metal being struck might fly off as a spark. The possibility of obtaining such a spark,

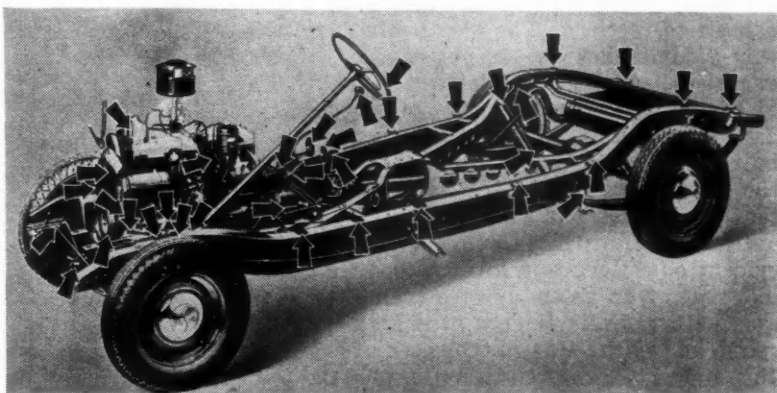
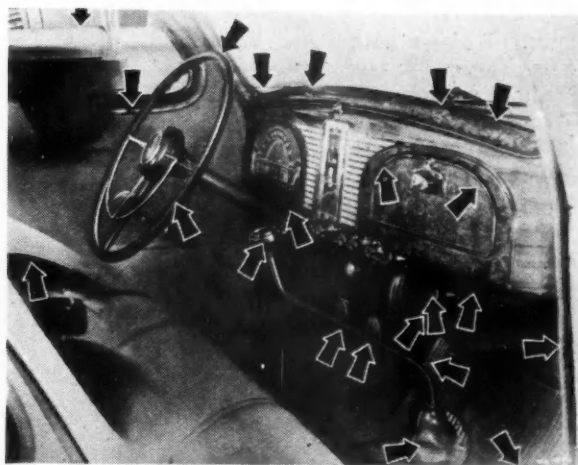
and particularly of obtaining sparks of sufficient intensity to cause ignition of inflammable materials, is very much less when striking a non-ferrous material such as beryllium copper against steel than is the case when using steel against steel."

Oil-Proof Wipers For Machine Shop Equipment

Oil-proof synthetic rubber wipers for use on lathes, planers, grinding machines, turret lathes, milling machines, and other machine shop equipment have been developed by the Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc., Passaic, N. J. The Monarch Machine Tool Co., Sidney, Ohio, with whom Manhattan engineers cooperated in this development, is installing these "Paranite" wipers as original equipment on its machines.

The maker claims that "Paranite" wipers, in addition to being resistant to the effects of oil, acid or other liquids, will not absorb grit, metal chips or abrasive material. They may be molded in sizes to suit the machines on which they are to be used and are installed to insure close tolerance between moving parts. They are also said to be resilient, tough and long-wearing.

Arrows on these photographs indicate 56 of the 272 places where rubber is used on the 1938 DeSoto. The weight of the material used per car amounts to 40 lb., excluding tires and tubes



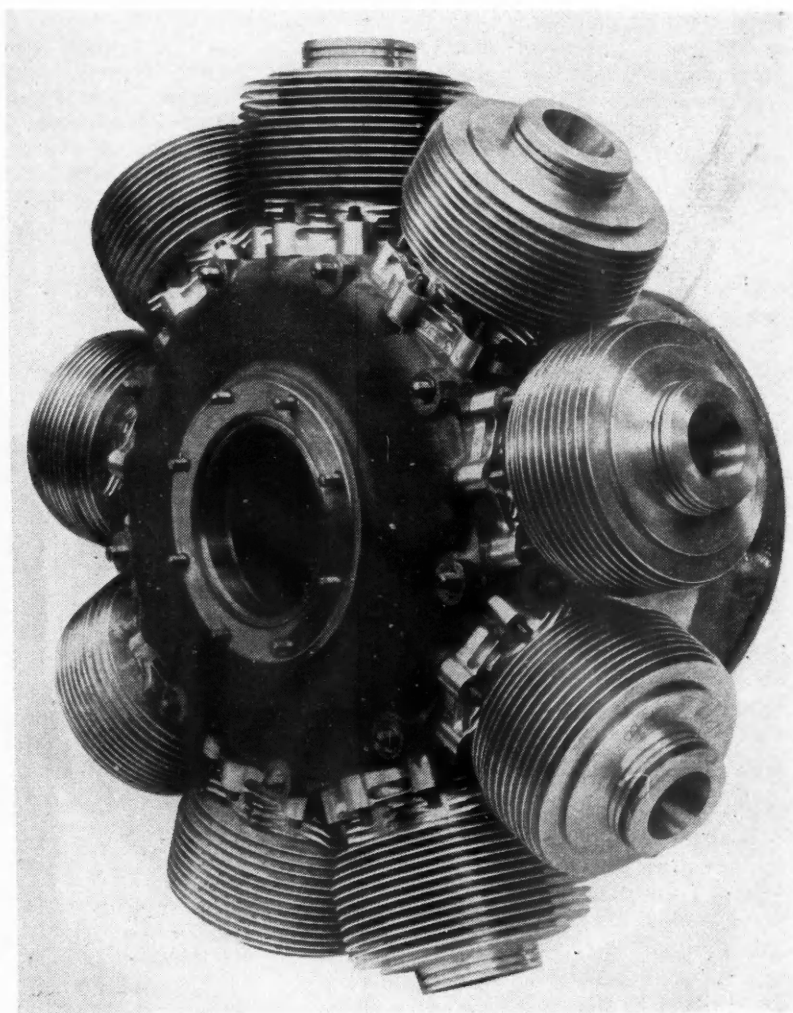
Mawen Aircraft Engine

THE news item in AUTOMOTIVE INDUSTRIES last week to the effect that the French automobile manufacturer E. E. C. Mathis and the Swedish industrialist Alex Wenner-Gren are backing the Mawen Motor Corporation, which is building a light radial aircraft engine in Long Island City, lends interest to recent reports in the French technical press regarding a French radial engine of the same name, which has been tested by the French Air Department, apparently with very satisfactory results. The peculiarity of the Mawen engine is that both the crankshaft and the assembly of crankshaft and cylinders revolve, the cylinder assembly revolving inside a stationary annular ring, in which there are ports that perform the valving or distribution functions. According to our information, the Engineering Branch of the French Air Service had an engine of this type, of 150 nominal hp., built, and this engine passed a 100-hr. test without mishap. Thereupon the construction of another, similar engine of 350 hp. was begun and designs for a two-row radial of 700 hp. were taken in hand.

A good idea of the general arrangement of the engine can be obtained from the photograph and the drawing reproduced herewith (from *La Technique Moderne*). Engines in which both the cylinders and the crankshaft revolve have been built previously (by the German Siemens & Halske firm, among others), but in the past both rotating members always rotated at the same speed, in opposite directions. The idea behind this plan is that the output of the engine depends on the relative speed of the cylinder block and the piston assembly, and if each of these can be rotated at, say, 1500 r.p.m., then the output should be the same as that of a conventional engine turning over at 3000 r.p.m. But there are evident objections to rotating a body like that of an assembly of a crankcase with radial cylinders at a high speed, and in the Mawen the speed of the engine block is relatively low.

It will be seen from the cross-sectional view that the cylinder assembly is supported at the right-hand side in a roller bearing of large diameter and that it carries an internal gear which meshes with a pinion on a countershaft that is supported in bearings in the engine housing. This countershaft also carries a spur pinion meshing with a spur gear on the crankshaft, the ratios of the train of gears being such that as the cylinder block makes one rotation in, say, the right-hand direction, the

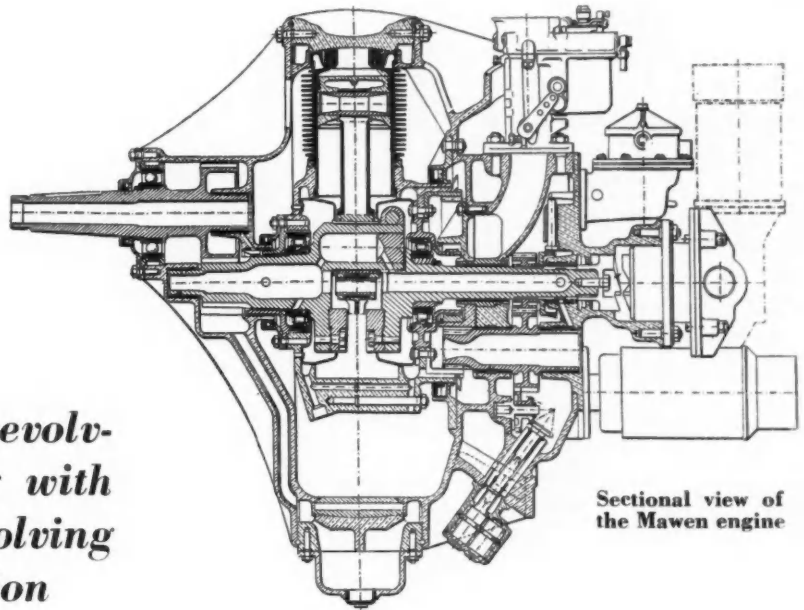
crankshaft makes nine revolutions in the opposite direction. Therefore, in one revolution of the cylinder block there will be ten double strokes of each of the pistons in its cylinder, and as the engine operates on the four-stroke cycle, there will be five cycles in each cylinder during each revolution of the cylinder block. This means that each cylinder during one revolution must come into communication with an inlet port five times, and an equal number of times with an exhaust port, and a photograph



View of the Mawen crankcase and cylinder assembly

Unique

in its arrangement of a revolving crankshaft assembly with a cylinder assembly revolving in the opposite direction



Sectional view of the Mawen engine

not reproduced here shows that there are five equally-spaced exhaust connections on the stationary annulus.

As the cylinder block turns only one-ninth as fast as the crankshaft, and the torque on both is of necessity the same (the two bearing to each other the relation of an action and a reaction), and as the motion of the cylinder block is geared up in the ratio of 9:1, it follows that the torque impressed on the crankshaft by the cylinder block is only one-ninth of that imparted to the crankshaft directly by the pistons and con-

necting rods. From the crankshaft the power is transmitted to the propeller shaft by spur gearing.

An interesting feature is that of the arrangement of the ports in the cylinder and the stationary annulus. It appears that each cylinder head has a sort of tubular extension or neck which comes close to but does not actually contact the annulus. A gas-tight joint is effected by means of sliding members inside and outside the tubular extension, which are provided with packing rings, and these sliding members, of course, are

pressed into contact with the bore of the annulus by the centrifugal force acting on them. Obviously, both intake and exhaust take place through the same port in the cylinder head, but through different ports in the annulus. The cross-sectional drawing also shows quite clearly the drive of the different accessories.

It is claimed that one of the most attractive features of this engine design is the low cost at which it can be produced (compared with the cost of current models of aircraft engines).

Production Lines

Independent Front

While in Chicago recently, had the pleasure of driving a car made by one of the Big Three, fitted with a new independent front spring suspension by a parts maker. In design it may be described as a transverse leaf spring parallelogram construction with short stub axles at the wheels. It incorporates an ingenious ball-bearing wheel design. How they do it we don't know but this suspension has no shock absorbers and they claim that shocks are not required. The car handles beautifully and is

free of wheel fight or steering shock under all road conditions. So stable is the arrangement that the steering gear is made extremely sensitive to wheel movement without encroaching upon steering safety. Chances are that this suspension will be ready for inspection soon because the patent situation seems to be in the clear.

Cheap Weight

While the modern farm tractor has been stripped and streamlined for action so that every pound tells, there still remains the problem of

putting weight on the rear wheels of the wheel-type machine so as to get the most out of engine torque. Low cost weight now is added by using the huge pneumatic rear tires filled with water containing calcium-chloride as an anti-freeze. Some of the larger tires carry as much as 300 lb. of water.

Standards Advance

Marvelous advances in fine finish are slowly but surely filtering through plants of the automotive industry. Example of the new technique is the finish honing of important mating parts of the engine for which a prominent machinery builder has a complete line of specialized machines. This company already has made its mark in the finish-honing of a wide variety of parts, some of (Turn to page 705, please)

Incandescent Electric Carbon Brazing

A NEW method of brazing, known as incandescent electric carbon brazing, was described to members of the American Welding Society in a paper by Walter Reed of the General Electric Co. and Leo Edelson of the Handy & Harman Co. Application of the new method, the authors said, has been greatly facilitated by the development of new brazing alloys and fluxes. Brazing alloys containing silver were found to have superior qualities, and only such alloys were considered in the paper.

In applying the new method of brazing, the parts to be joined are assembled and clamped between the electrodes of a pair of brazing tongs, and electric current is then passed through the work. Advantages claimed for this type of joint are:

1. It takes less time and costs less than mechanical or soft-solder joints.
2. Lighter sections of metal can be joined.
3. Joints do not require pre-tinning.
4. Parts can be joined close to insulation or supporting members.
5. The length of joint lap can be reduced.
6. Silver-brazed joints, when properly made, stand up under thermal overload, vibration, corrosion, and mechanical and electrical stress.

Alternating current is used, because of the ease of obtaining the necessary heavy current, which is supplied to the brazing tongs directly from a transformer. Ordinarily the primary voltage is 220, while the secondary voltage will range between 7.5 and 12. Portable transformers are used, as a rule.

Three types of electrode are available, soft, hard, and extra hard. All are made of carbon and graphite. The soft electrode has a low surface resistance, which practically eliminates risks of overheating the work in spots. It is of particular advantage when operators are new to the job. The hard type has a considerably greater surface

resistance and, therefore, operators should be given a certain amount of training before this electrode can be used. Its major advantage lies in the fact that brazing temperatures can be had with approximately 30 per cent less current. The "extra hard" electrode has the highest resistance, and the danger from "burning" the joint surface is such that it should be used only by skilled operators. Its advantage is that it offers top brazing temperatures with only about 50 per cent of the current required by the soft electrode. This means that comparatively large joints can be made with standard brazing equipment.

Investigations have shown that the best silver-brazed joints are obtained when there is some degree of diffusion between the alloy and the base metal. Diffusion, of course, is a function of time and temperature, and it depends also on the nature of the base metal. Most non-ferrous alloys show this diffusion on microscopic examination, but with steel and alloys of high melting point it is more difficult to recognize. However, examination of a large number of specimens at high magnifica-

tion indicates that there is some degree of diffusion with this class of material also.

One of the reasons for the good results obtained with this brazing method is that the joints are heated under pressure. In making lap joints, for example, the members are clamped between the electrodes under sufficient pressure to hold the parts securely together and make full, even contact. The current is usually applied intermittently, so that the heat is evenly distributed throughout the electrodes, thus avoiding hot spots. Heating continues until the proper brazing temperature is reached, as indicated by free flow of the brazing alloy.

In making butt joints on materials up to 1 in. in width, the ends to be joined should be square, for maximum contact area. The ends should be butted tightly, and the electrodes applied to the thin sides of both members. Straight butt joints can be used on sections $\frac{1}{8}$ in. thick or less, while heavier sections must be scarfed. The scarf should be approximately three times the thickness of the joint members.

In manufacturing operations the equipment usually consists of a press and apparatus for controlling the motion of the electrodes. Pressure is produced by means of an air cylinder or a lever. If necessary, the electrodes can be water-cooled. Presses of this kind, with capacities up to 100 kva., are said to be in constant use. For press work the soft electrode is most commonly used.

CHILTON ROUND TABLE

(Continued from page 690)

them with a front end looking as snappy as the snappier city-type buses.

From AUTOMOBILE TRADE JOURNAL

There seems to be quite a bit of discussion among mechanics about a law requiring mechanics to be licensed by the States before they can be considered a real honest-to-Gawd mechanic. This discussion takes the form of classifying the fellows as to their ability; the helper, the service station attendant, the general mechanic and the specialist.

There would be an examination of some sort which would determine the fellow's classification. He would then be issued a license, similar to a plumber's license,

after which he could command a certain wage scale.

From MOTOR WORLD WHOLESALE

Progress . . . is being made in the elimination of equipment sales to service stations by major oil companies and the growing inclination of these companies to recommend to their dealers that they purchase needed equipment from automotive wholesalers.

This development while still a long way from being the general policy of all major companies, nevertheless represents a movement that manufacturers of equipment and their wholesalers can well afford to watch carefully with a view toward doing everything constructive to help the policy become nationwide in application.

Just Among Ourselves

How Deep is the Ocean, How High is the Sky?

OBSERVERS of many kinds are beginning to show alarm again regarding the many things we don't know about the instalment selling system on which automobile volume has depended heavily for quite a few years now. The number of people who bought their first automobile reached its highest point about 1921, and from then on, the automobile market has been primarily a replacement market with its corollary used-car problem and a marked effort to produce artificial obsolescence by means of style changes.

C. F. Kettering and others have pointed out that when the industry of a nation does no more than meet a people's immediate needs, you have a static economy. But the effort to go beyond this point in the United States has sometimes created desires on the part of the public for new goods that have been beyond the public's immediate ability to pay. Such a condition has resulted in a tremendous volume of instalment credit, which has the definite virtue of being extremely sensitive and responsive to the need for stimulating a stagnant market.

For the past 15 years the whole country, and particularly the automobile industry, has been sailing in a lovely ocean of instalment credit and enjoying the view, without worrying about pilot charts and navigation rules. We don't know a whole lot about the depth of that credit ocean, its currents, or the meteorological data.

We have been proceeding on the basis that when a storm arrives we head for port, or in other words, clamp on artificial credit restrictions of various sorts.

This is not an indictment of instalment selling. There are very few people in the world qualified by sufficient information about the whole credit picture to make a sound judgment on the question.

But the possibility of a 60 per cent drop in this year's production of motor vehicles in the United States and Canada has sent many economists looking for an explanation in the direction of the tremendous consumer credit expansion of the last few years.

A few years ago the automobile was one of the few commodities which could be purchased on an instalment contract. Now birth and death, travel, and the multitudinous wants, real or artificial, of the whole population can be financed by the dribble system.

Because it was relatively easy to purchase and so many things can be done with it, the automobile has established itself as an American necessity. But as other desirables are made easy to purchase, they tend to establish themselves as "necessities" also and compete for the automobile dollar.

The automobile industry sponsored the instalment selling system as we know it today. The automobile industry may have to find some new way of expanding volume to pull away from the competition it has created for itself through the instalment selling system.

Appearance Verdict from the Highest Court

WE have been undertaking, in cooperation with Facts, Inc., a consumer survey covering a large number of questions about the appearance and other characteristics of American passenger cars. To refresh their minds on the question of appearance, those interviewed were shown pictures of similar models of all current passenger cars made in the United States. In order to salt the problem a little, some radical designs not yet in production and some of the more advanced European designs were included in the deck of pictures, without identification except by number.

One of the questions in the survey asked the persons interviewed to rate for appearance the half-dozen outstanding cars among the 32 whose pictures were shown.

Packard received the largest number of individual votes, followed by the Nash Ambassador, Graham, Buick, LaSalle, Lincoln Zephyr, Oldsmobile Six and Cadillac.

These are preliminary results and are subject to minor revisions. The whole story of the survey, and complete tabulations of the results will be the subject of a series of articles by Thomas G. MacGowan, to appear shortly in *AUTOMOTIVE INDUSTRIES*.

The Long Way Around—

CASUAL reading of the 1938 laws bulletin of the National Highway Users' Conference discloses the interesting fact that the legislators of the little State with the long name (Rhode Island and Providence Plantation) have been just as assiduous as their brethren of the larger States in seeking the utmost avenues for motor-vehicle taxation. Would you believe, for example, that the cumbersome machinery of State law would be brought to bear to amend Section 8 of Chapter 98 of the general laws of Rhode Island for the sole purpose of providing a \$2 annual levy for locomotive box-car vehicles used by La Societe des 40 Hommes et 8 Chevaux?

HERBERT HOSKING.

Radiator Design Considered As an

By DR. TECHN. M. F. TREER,
Budapest

IN the earlier stage of development of any technical device, inventions are the milestones of progress. In the later stages there are no milestones, but many small detail improvements which in the aggregate constitute further "miles" of development. During this later stage the question arises, whether there is a definite limit to the possible development, which can be approached but never passed, or

can take place in a still atmosphere, but it is greatly accelerated by air flow. This is due to the effect of skin friction between flowing air and solid walls. Skin friction produces turbulence of the air flow, and therefore a rapid mixing or blending of the heated air with the cooler. From this it is obvious that there must be a relation between the laws of heat conduction and those of skin friction. This relation was first formulated by Osborne Reynolds and was later further developed by the

In Fig. 1 are plotted the performance data of a car radiator. The rate of heat dissipation in B.t.u. per min. per sq. ft. of frontal area per 100 deg. Fahr. and the static pressure drop in inches of water are plotted against the mean air velocity through the radiator, in ft. per min. The full line for static pressure drop is based on experimental data, while the dotted line represents the calculated theoretical minimum. The distance between the two lines represents possible future development. When it is considered that the full line in Fig. 1 represents the best-known performance of modern automobile radiators* it will be seen that there is still much room for improvement.

But lowering of the static pressure drop through the radiator is only one phase of radiator development. The whole problem is essentially an economic one. We want to get rid of the heat absorbed by the cooling water and want to do so at the least possible cost. We must therefore consider what it costs us to get rid of this heat. In doing so we will simplify matters as much as possible and still obtain sufficiently accurate and clear results.

The cooling system affects the cost of the car in three ways. In the first place we have the cost of the system itself, which forms an item in the total cost of production of the car and is substantially proportional to the weight of the radiator core and shell. The other parts of the cooling system can be neglected, because they vary only little with a change in the size of the radiator. Secondly, the cooling system is a part of the weight that must be moved, and calls for a proportionate part of the engine displacement to develop the necessary power. In other words, because the cooling system must be transported, the entire car must be heavier and more expensive, and the cost of the complete car will be roughly in proportion to the increase in the total weight due to the need for the cooling system. Further, the radiator fan absorbs en-

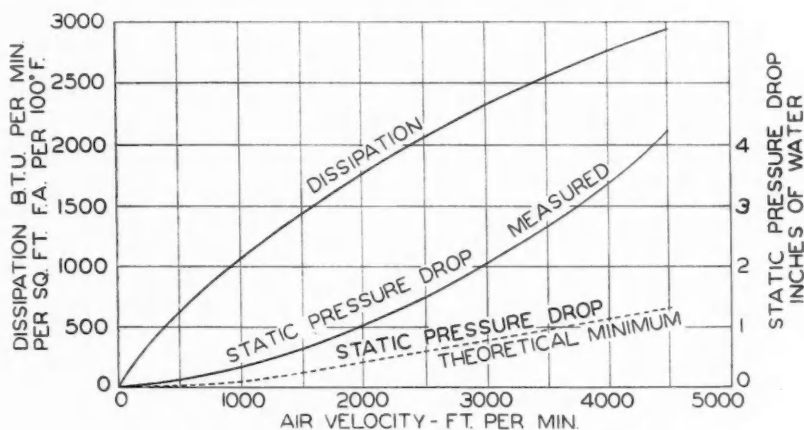


Fig. 1—Performance data of a car radiator

whether the possibilities are unlimited. As regards the development of automobile radiators, a limit is set by the laws of heat convection, and from these laws conclusions can be drawn as to further improvement.

The function of the automobile radiator is to transfer the heat absorbed by the combustion-chamber walls to the air surrounding the car. This transfer is effected by convection, and we must therefore make the laws of heat convection the basis of our reasoning. Heat convection is in reality a process of blending particles of air that have been heated by contact with the hot surfaces, with the cooler air of the surrounding atmosphere. Heat convection

writer*. This law of heat conduction is to the effect that the heat transfer is essentially proportional to the skin friction in the boundary layer of the flowing air. It is true that heat can be transferred also without skin friction, by conduction and radiation, but in automobile radiators these phenomena are so insignificant that they can be neglected.

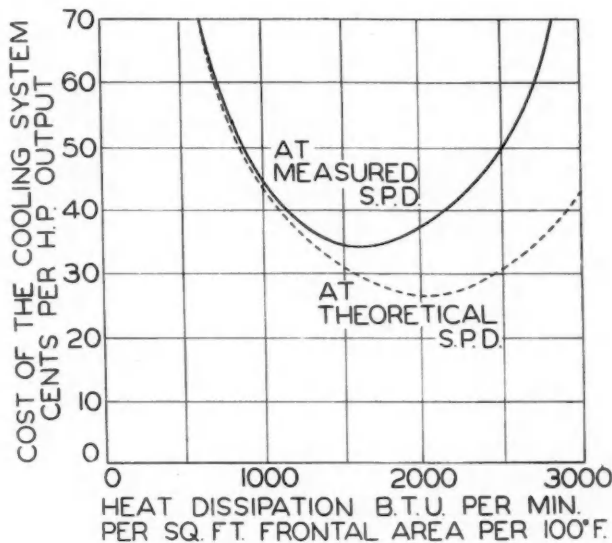
From the above-mentioned law of heat conduction we can calculate the skin friction needed in order to produce the required heat transfer, and from the skin friction in turn we can calculate the minimum static pressure drop in the radiator.

* Physikalische Zeitschrift, Jahrgang 35, Heft 6, p. 266.

* S.A.E. Journal, Vol. 39, No. 6, p. 496.

Economic Problem

Fig. 2—The cost of a system varies with rate of heat dissipation



engine power, and to provide this power the engine must again be made larger and heavier, which in turn makes the car heavier and more expensive, roughly in the proportion of the net engine power plus power absorbed by the fan, to the net engine power.

From Fig. 1 it can be seen that with a low rate of heat dissipation the air velocity is small, and the radiator core and shell will be large, heavy and expensive; but owing to the low pressure drop through the radiator, the power absorbed in moving the air is small. Now, of the

three items that make up the cost of an automobile cooling system, the third varies inversely to the other two. If the air velocity through the core is low, the radiator will be large and the cooling cost high. On the other hand, if the air velocity is high, the static pressure drop and the power required to move the air are large, which makes the third cost item high. The total cooling cost is a minimum for an intermediate air velocity.

How the cost of the automobile cooling system varies with the rate of heat dissipation is shown graphically in Fig. 2. Here the cost, in cents per horsepower engine output, is plotted against the rate of heat dissipation for the range covered in Fig. 1. The full-line curve is based on measured static pressure drops, the dotted-line curve on the theoretical minima. The higher the rate of heat dissipation, the more important it is to reduce the power absorbed in fan operation. At low rates of heat dissipation the cost of the cooling system is almost identical with that of the radiator core and shell, and therefore proportional to the weight of the latter. The latter factor has no minimum limit; in fact, possibilities with respect to radiator weight reduction are unlimited.

Production Lines

(Continued from page 701)

which are as follows—camshaft, cams and pins, crankshaft pins, engine main bearings, valve tappets, valve stems, etc. Here is one of the most important machine shop developments in many a year and we would like to get you posted on it.

Ball-Chain

We've all grown up with the familiar ball-chain used for key rings and lighting fixture pull cords. Now the industry has grown up and is seeking good applications in automotive design where there is undoubtedly room for a versatile item of this nature. Consider that the ball-chain

used as a pull cord, has the unusual feature of complete freedom from kinking or twisting since each joint acts like a swivel. It is made in many sizes up to one-quarter inch, the larger chain having a breaking strength well over 400 pounds. They have several rather ingenious applications in mind at the moment. But they can use some more ideas. We would like to serve as a clearing-house to the benefit of all concerned.

Pre-Cooled

Year ago at Indianapolis, a top-flight racing driver got the clever idea of precooling his crash helmet.

Half hour in a refrigerator kept the headpiece cool for over an hour in the blazing sun. Indianapolis this year will find extension of this practice to the Nth degree, thanks to a clever stunt that's in the make. Take our tip and watch for it come Decoration Day.

Gear Quality

Recent years have been most prolific in developments for producing better gears and improved quality control. One of the leading manufacturers in this field tells us privately that they will have a new gear measuring device ready for announcement in a few months. It's novel and employs a new principle. That is all we can tell you at the moment, but it's well worth waiting for.—J. G.

Fifty Pounds of Copper

(Continued from page 695)

amounts of arsenic added to the brass seem to have the same effect.

In the alpha-beta brasses, tin also minimizes this type of failure. Naval brass, an alloy of 60 per cent copper, 39 per cent zinc, and 1 per cent tin is a good example. A similar alloy made from high-purity copper and known as Tobin bronze, is characterized by high corrosion-fatigue resistance. This alloy finds application in bearings for starting motors.

There are many copper-base alloys other than the brasses which are useful for applications where corrosive conditions in service are severe. These include the copper-silicon alloys, tin bronzes, aluminum bronzes, cupro-nickels, and nickel silvers.

Copper-silicon alloys are a fairly new development. They are characterized by strength comparable to that of mild steel, and corrosion resistance virtually the same as that

of copper. However, addition of silicon to copper lessens both its thermal and its electrical conductivity to a point where these properties also are about the same as the corresponding properties of mild steel. Such alloys are easily welded.

Tin bronzes and aluminum bronzes both compare favorably with copper so far as corrosion resistance is concerned. One of their principal applications is as material for welding rod suitable for electric welding of copper sheet.

Generally, the aluminum bronzes are characterized by high strength. The aluminum content is rarely greater than 10 per cent. Apparently, under certain conditions, aluminum bronze containing more than 8 per cent aluminum will succumb to a type of corrosion which in effect is similar to "dezincification." These alloys are not readily weldable. Their automotive applications include valve seats, worm wheels, gears, valve guides, and forgings.

In his article on English practice in respect to automotive uses of copper and copper alloys, Mr. Neave states that "ordinary hot-stamped or die-cast aluminum-bronze parts have about 35 tons per sq. in. tensile strength, with 30 per cent elongation, and the fatigue limit of the forged material is upwards of plus or minus 14 tons per sq. in. By quenching in water from 1560 deg. Fahr., the hardness can be raised to 250 Brinell; the metal is then brittle, but a compromise between hardness and ductility can be secured by reheating or tempering at temperatures of 925 to 1100 deg. Fahr. Aluminum-bronze has superior properties to brass or manganese-bronze at high temperatures, and where cost permits, it has been substituted for these materials in various applications. Although not so good as a bearing metal, aluminum-bronze, sometimes with an addition of about 2 per cent lead, has also been used in lieu of phosphor bronze for certain bushes, and in die-cast form for worm wheels.

"Aluminum-bronze sand castings have been used in certain applications, such as cylinder-heads; also in some instances for the dies for motor-body sheets, where much longer die life is reported because of the bearing properties of the alloy, and the surface finish of the product is also said to be considerably improved. In such cases it is quite usual to add 1 to 3 per cent of iron, or manganese, or both, to refine the grain of the metal and to improve its mechanical properties by retarding self-annealing and excessive

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grain growth while cooling after casting. Unfortunately, aluminum-bronze has to be cast with considerable care to avoid inclusions of aluminum oxide, and related trouble, and the ordinary British foundry has not yet used this alloy as much as its otherwise good properties justify."

When nickel is alloyed with copper, the resultant metal is called cupro-nickel. In general, the cupro-nickels will resist chemicals, erosion, and impingement attack. They are superior to aluminum bronzes in service where corrosive conditions are unusually severe. Nickel silver comprise those bronzes in which varying amounts of copper have been replaced by a nickel addition. These are characterized by good ductility and strength, and are entirely suitable for stamping and forming. They surpass the bronzes in their corrosion resistance.

As regards points to be looked out for in designing parts to be made of copper or its alloys, R. A. Wilkins makes the following pertinent observation: "... it is often overlooked that cuprous materials do not have a 'yield point' in the sense in which that phrase is used in connection with ferrous materials, and that, therefore, where yield strengths, or yield points, are given for cuprous materials, such values are really only expressions of a property that by custom is assumed to exist, but which in fact had no real existence. The value of the assumed property of the yield point of a cuprous material is only an approximation of the value of its elastic limit. It is, therefore, recommended that the designer, in working with copper alloys, base his design on the existent property of elastic limit."

Copper-base alloys are very rarely successfully hardened and strengthened by heat treatment, and frequently these properties must be imparted to the metal by cold working. Stress-corrosion cracking may result in the bronzes, aluminum bronzes, and silicon-copper alloys due to residual stresses in the metal after it has been cold-worked. "Relief annealing" is recommended by one authority for certain applications.

Mr. Wilkins cautions design engineers that, "in ordering products made of the modified bronzes, such as Naval brass, manganese bronze, and similar alloys, they should avoid specifying physical properties which represent maxima obtainable only through extreme cold-working of such alloys. It is seldom possible to retain such maxima in adequately relief-annealed products."

Peru Forbids Importation of Used Cars

Imports into Peru of used automobiles for commercial use or for resale purposes is now forbidden, according to the terms of a decree made public in Peru and reported to the Department of Commerce by the office of the American Commercial Attache at Lima.

This prohibition does not apply to used vehicles which tourists bring with them for personal use while

in the country, the report states. It was stated in Peru that the importation of used cars into that country competes with the new car business which depends largely upon trade-ins.

The report also stated that effective June 1, 1938, all passenger automobiles imported into Peru must be fully equipped with safety glass windshields and windows. In the event that the imported automobiles are not so equipped they will not be permitted clearance by the customs authorities.

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